

Tennessee Department of Environment and Conservation

DOE Oversight Division



Status Report to the Public

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Terms & Acronyms

ATSDR Agency for Toxic Substances and Disease Registry

BMAP Biological Monitoring and Abatement Program

CAP Oak Ridge Reservation Local Oversight Committee Citizens' Advisory Panel

CDC Centers for Disease Control and Prevention

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act of 1980

D&D decontamination and decommissioning

DOE U.S. Department of Energy

EMWMF Environmental Management Waste Management Facility

EPA U.S. Environmental Protection Agency

ETTP East Tennessee Technology Park

FFA Oak Ridge Federal Facility Agreement

FSP Facility Survey Program

FY fiscal year

HFIR High-Flux Isotope Reactor

LOC Oak Ridge Reservation Local Oversight Committee

M&EC East Tennessee Materials and Energy Corporation

MSRE Molten Salt Reactor Experiment

NEPA National Environmental Policy Act of 1969

NPDES National Pollutant Discharge Elimination System

ORNL Oak Ridge National Laboratory

ORR Oak Ridge Reservation

PCB polychlorinated biphenyl

RCRA Resource Conservation and Recovery Act of 1976

REDC Radiochemical Engineering and Development Center

ROD Record of Decision

SNF spent nuclear fuel

SNS Spallation Neutron Source

SWSA Solid Waste Storage Area

TDEC Tennessee Department of Environment and Conservation

TEMA Tennessee Emergency Management Agency

TOA Tennessee Oversight Agreement

TRU transuranic

TSCA Toxic Substances Control Act of 1976

TVA Tennessee Valley Authority

UF₆ uranium hexafluoride

USACE U.S. Army Corps of Engineers

Executive Summary

BACKGROUND

In 1942, construction began on enormous complexes across the nation created to support the Manhattan Project, a massive, top-secret effort during World War II to build the atomic bomb. The 35,545-acre Oak Ridge Reservation (ORR) in Tennessee remains as a legacy to the Manhattan Project and to the Cold War that followed. The ORR is currently owned by the U.S. Department of Energy (DOE), and approximately 15 percent of its total area is contaminated by hazardous and radioactive materials.

During World War II, four plants were built on the ORR to create materials for nuclear weapons; these plants were given the code names S-50, K-25, Y-12, and X-10. S-50, a thermally operated uranium enrichment facility, was operated for about a year and dismantled when it proved inefficient. K-25 and Y-12 enriched uranium using more successful techniques: K-25 used gaseous diffusion and Y-12 used electromagnetic separation. X-10 developed the technology to produce plutonium, which was then transferred to the Hanford Plant in Washington for full-scale production.

K-25, Y-12, and X-10 still exist as East Tennessee Technology Park (ETTP), the Y-12 National Security Complex, and Oak Ridge National Laboratory (ORNL). During the Cold War, these facilities played a key role in maintaining materials and components for nuclear weapons and in preserving a technological lead over the Soviet Union. In the past decade, the missions of Y-12 and ORNL have continued to evolve, while ETTP has been targeted for cleanup and closure.

Over the last 60 years, DOE and agencies that preceded it contaminated more than 500 sites on or near the ORR. This legacy of contamination is being cleaned up to levels that comply with current environmental laws, particularly the Comprehensive Environmental Response, Compensation, and Liability Act of 1980. Indeed, much of the DOE mission now centers on environmental management.

SCOPE OF THIS STATUS REPORT

The Tennessee Department of Environment and Conservation DOE Oversight Division (the "division") performs independent monitoring and oversight of DOE's cleanup and waste-management actions. The division has performed this role since the Tennessee Oversight Agreement was signed in 1991. This status report summarizes the state of Tennessee's perspective on federal cleanup progress at the ORR. The results of state monitoring and analysis are also evaluated, as are the quality and effectiveness of DOE environmental monitoring and surveillance programs.

MAJOR FINDINGS

DOE undertook a number of new high-risk projects this year and completed several begun in prior years. In its oversight of these activities during state fiscal year 2004, the division found no immediate threats to public health from current activities on the ORR, even though public activities were disrupted twice by DOE emergencies. A sodium

Executive Summary

metal fire at ETTP and a radioactive spill on State Highway 95 in May 2004 indicate that improvements are needed. DOE must continue to properly manage radioactive and hazardous materials and wastes found across the ORR, to protect the public, workers, the environment, and national security.

DOE is attempting to accelerate cleanup on the ORR, with a goal of accomplishing the massive amounts of work necessary to achieve several site closures by 2008. The division has renegotiated schedules to enable this program to move forward in a more flexible manner. However, delays and problems have already begun to surface. If cleanups fail to progress as promised or if shortcuts are taken due to funding shortfalls or schedule constraints, then there is potential for harm to the public or the environment.

The on-site Environmental Management Waste Management Facility (EMWMF) has a key role in providing a low-cost disposal option for some cleanup wastes. The division oversees the process for deciding which wastes will be allowed in the facility and which must be sent off-site for disposal. Problems with rainwater and runoff management this year have called the design of the EMWMF into question. DOE plans to modify the facility to better address these problems.

Overall, there have been no major changes, either positive or negative, to the quality of air, surface water or groundwater leaving the ORR over the past year.

KEY ISSUES AND CHALLENGES

The division has identified five major issues and challenges for DOE.

1. Groundwater management strategies must be determined as source cleanups are completed. Because groundwater is a long-term remediation problem, DOE must ensure adequate controls are in place to monitor, maintain, and modify groundwater remedies as necessary well into the future.
2. Effective long-term stewardship must include record keeping, enforcement, surveillance, maintenance, monitoring, and sufficient funding. DOE's stewardship plans are still vague, although long-term needs should be accounted for as remediation actions take place.
3. DOE must maintain commitment to its Accelerated Cleanup Plan by providing sufficient resources to meet the agreed milestones. Problems with the schedule have arisen this year. DOE's responsibility to keep the public informed about environmental decisions must also be maintained, despite increased security.
4. Characterization and disposal of stored radioactive waste continues to be a challenge. DOE must show a higher priority on this activity, especially with mixed waste treatment under the Oak Ridge Site Treatment Plan, to achieve accelerated cleanup. Treatment, shipping and disposal of transuranic waste must also be accomplished in a timely manner, and DOE must resolve national issues that have already delayed this activity.
5. Plans for documentation, preservation, and commemoration of historic facilities and artifacts must be finalized before demolition of major Manhattan Project-era facilities proceeds much further. The public should be included in these decisions.

1.0 Introduction

1.1 HISTORY OF THE PROBLEM

Oak Ridge, Tennessee, was created to support the Manhattan Project, the secret World War II effort to develop the atomic bomb. The plants and town site were carved out of Appalachian valleys and ridges in 1942. After the end of the war, plant research and production supported the arms buildup associated with the Cold War. The U.S. Department of Energy (DOE) and its predecessor agencies left a legacy of buildings, lands and streams contaminated by radioactive and hazardous wastes. Especially in the early years, toxic and radioactive materials washed down streams and were released into the air from government lands. Wastes were later placed in long-term storage, where much still remains, yet to be properly tested and disposed of.

Three major industrial complexes remain on the Oak Ridge Reservation (ORR)—the Y-12 National Security Complex (formerly known as the Y-12 Plant), East Tennessee Technology Park (ETTP, formerly known as the K-25 Site and as the Oak Ridge Gaseous Diffusion Plant), and Oak Ridge National Laboratory (ORNL, formerly known as X-10). The missions of these facilities have changed over the years, but they continue to produce radioactive and hazardous wastes and to discharge small amounts of these substances into the environment. These activities are now regulated under federal and state laws and permits.

During World War II, Y-12 enriched uranium using an electromagnetic process; this process turned out to be relatively inefficient and was ultimately abandoned in favor of



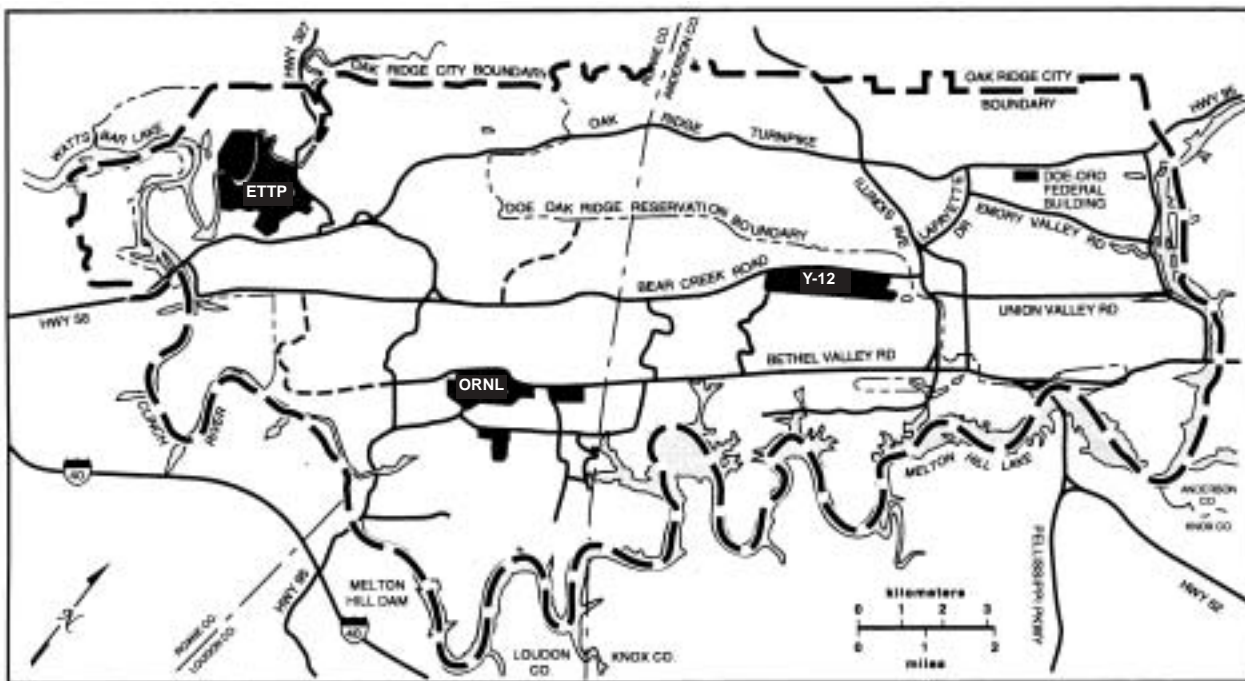
The Oak Ridge Reservation is located in East Tennessee. Map courtesy of U.S. Department of Energy (Oak Ridge Reservation Annual Site Environmental Report for 1998, DOE/ORO/2091).

1.0 Introduction

gaseous diffusion. Y-12 then became the center for precision machining of special nuclear materials for nuclear weapons manufacturing. Y-12 now refurbishes and disassembles nuclear weapons and is the national repository for highly enriched uranium. It has also been designated the National Prototype Center in recognition of the unique expertise of its machinists.

K-25, the first gaseous diffusion plant, gave its name to the surrounding industrial complex. The complex ceased producing enriched uranium in the 1980s and refocused its mission on environmental management. Now known as Heritage Center at ETPP, its current goal is to transfer reusable buildings to the private sector, a process known as "reindustrialization." Those facilities that are too contaminated to renovate will be demolished. After cleanup is complete, ETPP is to become the site for an industrial park. The Toxic Substances Control Act of 1976 (TSCA) Incinerator is also located at ETPP. This is the nation's only facility permitted to incinerate radioactive waste mixed with hazardous waste containing polychlorinated biphenyls (PCBs), and it is key to cleanup of the ORR and other DOE sites. The TSCA Incinerator is scheduled to be decommissioned in 2006.

The X-10 plant originally pursued weapons research and development, and piloted the purification technique for plutonium production. Today, ORNL conducts research in a wide variety of scientific fields. It is famous for its contributions to neutron science and is the site of the Spallation Neutron Source (SNS), a major research facility nearing completion.



The Oak Ridge Reservation lies about 20 miles west of Knoxville and straddles Roane and Anderson Counties. Map courtesy of U.S. Department of Energy (Oak Ridge Reservation Annual Site Environmental Report for 1998, DOE/ORO/2091).

1.0 Introduction

The story of Oak Ridge and details of the environmental damage caused by improper waste disposal are given in a community publication, *Oak Ridge, Tennessee: A Citizen's Guide to the Environment*. This publication can be downloaded from the following web sites: <<http://www.local-oversight.org/links.htm>> and <<http://www.oakridge.doe.gov/em/ssab/links.htm>>.

1.2 DIVISION OBJECTIVES

The Tennessee Department of Environment and Conservation (TDEC) formed a DOE Oversight Division ("the division") in 1991 under the Tennessee Oversight Agreement (TOA). The division pursues five primary objectives:

- To monitor and effect DOE's compliance with applicable laws, regulations, Oak Ridge Federal Facility Agreement (FFA) provisions, the TOA, DOE Orders, administrative policies, approved procedures, and appropriate guidelines;
- To evaluate the effectiveness of radiological controls implemented on the ORR by DOE and its contractors;
- To characterize and identify radiological and hazardous contaminants and exit pathways on the ORR and surrounding areas and to determine the potential impact of DOE activities on the welfare of Tennessee's citizens and environment;
- To support DOE in employing the corrective measures necessary to provide a healthful environment for the citizens of the state; and
- To monitor contaminant releases under conditions of emergency response and provide requested services to the Tennessee Emergency Management Agency (TEMA) as described in its Multi-Jurisdictional Emergency Response Plan for the ORR.



Striped bass and other sport fish are taken from the Clinch River near the ORR by recreational fishermen. TDEC photo

The results of these activities and the current status of environmental health on the ORR are summarized in this report.

2.0 Jurisdiction

2.1 TENNESSEE OVERSIGHT AGREEMENT AND THE DOE OVERSIGHT DIVISION

The state of Tennessee and DOE signed the TOA in 1991, and TDEC created the division the same year to carry out its responsibilities under the agreement. The TOA provides a framework and funding for the state to oversee DOE's effects on the community in four ways:

- A regulatory program to support state participation in the FFA (see Section 2.2);
- A non-regulatory program of independent environmental monitoring and oversight to supplement activities conducted under applicable environmental laws and regulations;
- An emergency response program to help ensure that the state and local communities are prepared in case DOE creates an off-site emergency; and
- An outreach program to increase public awareness and involvement by citizens and local governments in DOE's Oak Ridge operations.

2.2 FEDERAL FACILITY AGREEMENT

The state, DOE and the U.S. Environmental Protection Agency (EPA) ratified the FFA in 1992. It provides a legal framework allowing the division to enforce DOE cleanup of contamination from past ORR activities. Oak Ridge has an FFA because the ORR is listed on the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) National Priorities List.

NEPA applies to proposed federal actions that could significantly affect the human environment.

The division coordinates state activities under the FFA. The agreement itself outlines a procedure for cleanup on the reservation, including the identification of problems, scheduling of activities, and implementation and monitoring of appropriate responses. Actions taken under the FFA conform to CERCLA, the Resource Conservation and

Recovery Act of 1976 (RCRA), and other federal and state laws.

The National Environmental Policy Act of 1969 (NEPA) applies to proposed federal actions that could significantly affect the human environment, requiring federal agencies to consider environmental impacts and provide for public review and comment. Although NEPA reviews are not required for projects performed under CERCLA, DOE is required to incorporate NEPA values (i.e., consideration of public input on potential impacts to the environment) into CERCLA actions.

CERCLA documents related to cleanup decisions on the ORR are available for the public to review at DOE's Information Center (see Section 7.4.4).

2.0 Jurisdiction

2.3 NATIONAL ENVIRONMENTAL POLICY ACT

NEPA requires federal agencies to ensure that citizen participation and environmental impacts are properly factored into the agency's decision-making.

The division commented on the following NEPA documents in fiscal year (FY) 2004:

- *Draft Environmental Impact Statement (EIS) for the Waste Management West Valley Demonstration Project (WVDP) Cattaraugus County, NY.* This document included an option to transport transuranic waste to Oak Ridge for storage and treatment.
- *Draft Environmental Impact Statement (EIS) for the Long-Term Management of Defense Stockpile Center (DNSC) Excess Elemental Mercury.* This document included an option for storage of elemental mercury at the Y-12 National Security Complex.
- *Annual Report: Implementation of Mitigation Action Plan (MAP) for Lease of Parcel ED-1 on the Oak Ridge Reservation.* This report describes how potential damage to natural areas during development of the Horizon Center industrial park will be prevented or minimized.
- *Environmental Assessment (EA) for the Transportation of Highly Enriched Uranium (HEU) from the Russian Federation to the Y-12 National Security Complex (DOE/EA-1471).*
- *Draft Environmental Impact Statement for a Proposal to Construct, Operate, Maintain, and Decontaminate and Decommission a Depleted Uranium Hexafluoride Conversion Facility at Paducah, Kentucky (DOE/EIS-0359).* This document includes an option for cylinders of depleted uranium hexafluoride at ETTP to be transported to Paducah for processing at the conversion facility.
- *Draft Environmental Impact Statement for a Proposal to Construct, Operate, Maintain, and Decontaminate and Decommission a Depleted Uranium Hexafluoride Conversion Facility at Portsmouth, Ohio (DOE/EIS-0360).* This document includes an option for cylinders of depleted uranium hexafluoride at ETTP to be transported to Portsmouth for processing at the conversion facility. This is the preferred option for disposition of Oak Ridge's 7000 cylinders.

NEPA requires decisions to be made through a sustained process of inquiry, analysis, and learning. It ensures that federal agencies provide the public an opportunity to learn about and comment on significant proposals. When followed as required, it ensures adequate planning and prevents costly mistakes.

NEPA documents related to federal decisions affecting the ORR are available for the public to review at DOE's Information Center (see Section 7.4.4).

2.0 Jurisdiction

Comprehensive Environmental Response, Compensation, and Liability Act of 1980

Commonly known as “Superfund,” CERCLA was enacted in 1980. It establishes a trust fund for cleaning up abandoned or uncontrolled hazardous waste sites. It also sets up rules governing these sites and holding those responsible for the contamination liable.

CERCLA lays out the steps through which DOE must proceed in cleanup planning under its environmental restoration program. The “CERCLA process” guides DOE through seven clearly defined steps:

- Planning,
- Investigation,
- Feasibility analysis,
- Development of alternatives,
- Public participation,
- Selection of alternatives, and
- Creation of a final, legal decision embodied in a document known as a Record of Decision (ROD).

The ROD is a key milestone in CERCLA decisions because it establishes the legal and technical requirements for a given cleanup. Once the state and EPA have signed a ROD, DOE is responsible for carrying out the actions outlined in the document. The ROD, and cleanup actions taken under it, are designed to ensure that all unacceptable risks to human health and the environment are eliminated or controlled as much as possible.

The state is responsible under the FFA for coordinating, reviewing, commenting on, and approving each phase of the CERCLA cleanup. The phases include remedial investigations, feasibility studies, RODs, remedial designs, remedial actions, and follow-up evaluations. These phases are present to ensure success of the cleanup. The FFA involves the state directly in program management, dispute resolution, project prioritization, and milestone scheduling.

Resource Conservation and Recovery Act of 1976

This law gives EPA authority to control hazardous waste from “cradle to grave.” It covers the generation, transportation, treatment, storage, and disposal of hazardous waste. It also provides a framework for managing non-hazardous wastes. RCRA focuses only on active and future facilities.

DOE’s waste management program must answer to the state’s delegated authority under RCRA. The division does not enforce RCRA regulations, but it can and does

Continued on next page

2.0 Jurisdiction

Continued from previous page

document violations, which are then dealt with by TDEC's Division of Solid Waste Management.

National Environmental Policy Act of 1976

NEPA is the basic national charter for protection of the environment. It establishes policy, sets goals, and provides means for carrying out the policy. NEPA requires DOE and other federal agencies to provide public officials and citizens with environmental information regarding proposed federal actions that could affect the quality of the environment. With regard to major decisions regarding CERCLA activities, DOE has incorporated "NEPA values," including public participation and broad assessment of possible impacts. The division's NEPA program reviews NEPA documents that pertain to DOE activities on the ORR.

Natural Resources Damage Assessment

The division also participates in Natural Resources Damage Assessment activities. Federal law authorizes this program, which gives natural resource trustees at the state and federal level a means of recovering environmental damages caused by releases from CERCLA sites. Specifically, the program is intended to address damages that cannot be effectively corrected through cleanup.

As of this writing, the state and DOE have reached a partial settlement regarding compensation for natural resources damages to Lower Watts Bar Reservoir. The partial settlement is in the form of a permanent conservation easement on approximately 3,000 acres of undeveloped ORR lands north of Horizon Center at ETTP.

Other Laws

Other laws applicable to environmental management at the ORR include the following:

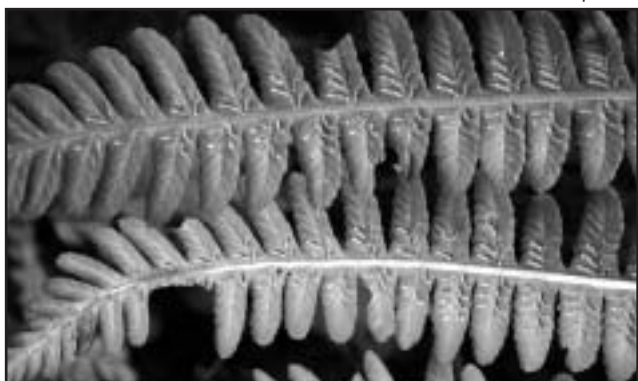
- Clean Air Act (1970)
- Clean Water Act (1977)
- Emergency Planning and Community Right-to-Know Act (1986)
- Federal Hazardous Substance Act (1966)
- Federal Facility Compliance Act (1992)
- Safe Dam Act (1973)
- Safe Drinking Water Act (1974)
- Solid Waste Disposal Act (1965)
- Toxic Substances Control Act (1976).

2.0 Jurisdiction

Box turtles, right, thrive in the woodland habitat of the Black Oak Ridge Conservation Easement. Silver glade ferns, below, are native to the southeastern United States and are found on the conservation easement.



TDEC photo



TDEC photo



TDEC photo

Penstemon, a perennial plant endemic to North America, blooms in late spring and into the summer.

2.4 OTHER PLANNING AND POLICY ISSUES

The division also reviewed and commented on the *Depleted Uranium Hexafluoride (DUF₆) Conversion Project Waste Management Plan*. . This plan describes how wastes generated by the conversion project will be properly disposed.

2.5 NATURAL RESOURCE DAMAGE ASSESSMENT

On December 20, 2002, the governor of Tennessee, DOE's assistant secretary for environmental management, and DOE's manager of Oak Ridge Operations signed an agreement in principle to work toward setting aside approximately 3,000 acres of land on the ORR as a conservation easement. The conservation easement on Black Oak Ridge is to be managed in accordance with state laws regarding natural areas and wildlife management areas. Within this agreement in principle, the state agrees—after consultation with the other Natural Resources Damage Trustees—to credit DOE with the value of this land and funding provided for management of it toward any future natural resource damage claim arising from DOE's activities on the ORR.

This conservation easement is the first of its kind in Tennessee. It is being pursued in response to damages at the Lower Watts Bar Reservoir. The easement is being developed through a joint effort by the state, DOE, the U.S. Fish and Wildlife Service, and the Tennessee Valley Authority (TVA).

The state is developing a resource management plan for this area and began soliciting public input at an August 2003 public meeting in Oak Ridge. Much valuable input has been received as a result of this meeting.

3.0 Environmental Management

3.1 RECENT PROGRESS

3.1.1 Environmental Restoration

CERCLA-driven environmental cleanup at the ORR is proceeding rapidly. Based on the Accelerated Cleanup Plan, most remedial action is focused within ORNL's Melton Valley Watershed and at ETTP (former K-25 Site). However other activities continue throughout the reservation.

In Melton Valley, work is under way to complete capping of the Solid Waste Storage Area (SWSA) 4 waste burial ground and begin capping of the large SWSA 5 waste burial ground. In addition, several buildings have been removed, monitoring wells and hydrofracture wells have been plugged, and contaminated soils have been excavated and disposed. Fieldwork has recently begun to remove, treat, and dispose of the transuranic (TRU) waste within 22 storage trenches in the SWSA 5 North portion of Melton Valley.

Activities at ETTP consist predominantly of the decontamination and decommissioning (D&D) of the large gaseous diffusion buildings on the site. Completion of D&D of the K-29, K-31, and K-33 buildings is now projected for March 2005. D&D of the older and more contaminated K-25 and K-27 buildings is just now moving into high gear, with completion expected by 2008. In addition to the large gaseous diffusion buildings, D&D activities at ETTP involve the removal and disposal of debris and equipment from approximately 500 buildings and ancillary structures.

Activities at ETTP consist predominantly of the D&D of the large gaseous diffusion buildings on the site.

In conjunction with these D&D activities, work was begun to carry out one Record of Decision (ROD) (for interim actions in Zone 1) and the decision process is nearing completion for another (for soil, buried waste, and subsurface structures in Zone 2). Both of these RODs will direct DOE to excavate and dispose of all contaminated soils and scrap, taking the site to a cleanup level appropriate for an industrial land use. After the projected 2008 CERCLA completion date at ETTP, DOE will remain responsible for maintaining institutional controls at the site.

In addition to the activities discussed above, which are tied to the Accelerated Cleanup Plan Agreement, cleanup is continuing at the Y-12 National Security Complex (in accordance with the Upper East Fork Poplar Creek Phase I ROD) and ORNL (in accordance with the Bethel Valley Interim ROD).

An engineering study is under way in Bethel Valley to determine the extent of groundwater contamination on-site as well as to identify contaminated soils that must be removed and disposed. An example of the latter is the Core Hole 8 source soils, which

3.0 Environmental Management

have been discussed extensively in previous reports. These soils are now scheduled to be removed in FY 2005.

In accordance with the Phase I ROD, this past year's activities at Upper East Fork Poplar Creek have largely involved the design and construction of the Outfall 51 water treatment system. This system will collect and treat a long-term, mercury-contaminated discharge to East Fork Poplar Creek. When completed this year, this treatment is anticipated to reduce mercury concentrations significantly in East Fork Poplar Creek. The target is to reduce mercury levels to less than 200 parts per trillion within East Fork Poplar Creek as it exits the Y-12 plant site and flows into residential areas of Oak Ridge.

3.1.2 Accelerated Cleanup Plan

The Oak Ridge Accelerated Cleanup Plan, which was agreed upon by the state, DOE and EPA in June 2002, is now under way. The plan accelerates the completion of cleanup at ETTP to 2008, completion of the Melton Valley Interim ROD to 2006, and the disposal of all low-level legacy waste to 2005. It was put in place primarily to reduce long-term cost and to expedite remediation of the most contaminated sites on the ORR. The accelerated plan is a large undertaking that demands a sincere commitment by DOE and Congress to assure adequate funding. While Tennessee remains committed

Although only 2 years into the plan, DOE is already seeing the need to delay FFA milestones.

to the accelerated plan, the division is concerned that adequate funding may not be forthcoming. Although only two years into the plan, DOE is already seeing the need to delay FFA milestones. If this trend continues, it is most probable that the plan will not meet its objectives. The state is also concerned that rapid acceleration of CERCLA activities on the ORR as a result of the Accelerated Cleanup Plan, and the DOE contract to accomplish that plan may lead to shortcuts in planning, contaminant and waste characterization, conduct of actual cleanup work, and oversight. The recent need to conduct three separate Type B accident investigations

associated with DOE cleanup projects may be an indicative problem in this area. Type B accidents are those with release of or exposure to hazardous or radioactive materials; potential for serious injury; or damage costs between \$1 million and \$2.5 million.

Melton Valley Interim Record of Decision. The Melton Valley Interim ROD includes most of the sites grouped in the Melton Valley portion of White Oak Creek Watershed and a few projects from Bethel Valley (Section 3.2).

East Tennessee Technology Park Closure Project. The ETTP Closure Project will concentrate on extensive D&D of the massive gaseous diffusion plants and their support facilities, allowing cleanup of underlying soils. All actions under the ETTP Watershed (Section 3.4) will be part of this project.

Balance of Program. The Balance of Program includes remediation at Y-12 (see Section 3.3), which encompasses both the Upper East Fork Poplar Creek and Bear Creek Valley watersheds; actions at ORNL (Section 3.2) in the Bethel Valley portion of

3.0 Environmental Management

White Oak Creek Watershed, off-site closures at sites in Oak Ridge and Knoxville, and waste management activities (Section 3.5).

3.2 OAK RIDGE NATIONAL LABORATORY

3.2.1 White Oak Creek Watershed-Bethel Valley

The 800-acre Bethel Valley Watershed contains the main plant area of ORNL. The watershed is bounded to the south by the White Oak Creek Watershed-Melton Valley and to the north by the Bear Creek Valley Watershed.

This watershed contains the area known as Waste Area Grouping 1: industrial buildings, laboratories, research reactors, and support facilities such as tank systems, pipelines, and other ancillary equipment. The wastes located in the Bethel Valley portion of the watershed came from operations such as the following:

- Nuclear reactors;
- Radioisotope operations;
- Particle accelerators;
- Hot cell operations;
- Physical, chemical, and biological research;
- Fuel chemical reprocessing research; and
- Analytical laboratories.

Bethel Valley Watershed also contains the Waste Area Grouping 3 Burial Grounds to the west and the Waste Area Grouping 17 Shop Area. Waste area groupings 3 and 17 are not as seriously contaminated as other areas but still must be closed out.

Bethel Valley Interim Record of Decision. The Bethel Valley Interim ROD was completed and signed by the FFA parties in May 2002. This ROD covers cleanup of surface water, soils, buildings, and contaminated source areas while deferring decisions on groundwater. The signing of this ROD is a milestone and begins several years of CERCLA remediation within the Bethel Valley Watershed.

The Molten Salt Reactor Experiment. The Molten Salt Reactor Experiment (MSRE) operated from 1965 to 1969, after which it was mothballed. The remediation and closure of the MSRE facility was begun in late FY 1994 and is still under way. This activity, authorized under a CERCLA ROD, involves the removal and disposition of reactor fuels (solidified salts of beryllium fluoride, lithium fluoride, zirconium fluoride, uranium fluoride, and trace quantities of other fluoride compounds). This material is currently scheduled for removal by the end of FY 2005.

The following MSRE activities, overseen by the division's Environmental Restoration and Radiological Monitoring and Oversight programs, took place in FY 2004:

Reactive Gas Removal. The Reactive Gas Removal System became operational in FY 1997. DOE initiated this action to purge uranium hexafluoride (UF₆) and fluorine gas from the off-gas piping system. To date, the Reactive Gas Removal System has

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removed more than 61 percent of the MSRE uranium in the form of UF_6 . This system will remain operational for the duration of the MSRE remediation project. Only very small amounts of UF_6 were removed from the system during FY 2004.

Uranium Deposit Removal. The uranium deposit was removed from the auxiliary charcoal filter bed in FY 2001 and contains approximately 2.7 kg of uranium-233 (U-233). The removal action report for this activity was completed and approved in FY 2002. The uranium-embedded charcoal deposit is currently being stored in a safe-geometry configuration in a shielded canister on top of the MSRE reactor shield blocks in the reactor high bay. The uranium deposit is scheduled to be relocated to the U-233 storage facility in ORNL building 3019 in mid-FY 2005.

Fuel and Flush Salt Removal. This remedial action addresses separation and removal of the uranium from the fuel and flush salts in the drain tanks, storage of the uranium as part of the U-233 repository inventory, subsequent removal of the fuel and flush salts from the drain tanks, and placement of the salts in stable storage. Fuel and flush salt removal began in late FY 2004 and is scheduled for completion in late FY 2005. Following fluorination for removal of the uranium as UF_6 , the U-233 will be placed in interim storage at ORNL building 3019 and dispositioned with the rest of the U-233 material. The MSRE Phased Construction Completion Report is scheduled for completion in late FY 2005, with approval scheduled for early FY 2006.

ORNL Corehole 8 Source Removal. This site is a plume of groundwater contaminated with strontium-90. The contamination can be traced back to highly contaminated soils and a leaking liquid low-level radioactive waste tank located in the main ORNL plant area. After excavation of approximately 90 percent of the contaminated soil around leaking underground waste tank W-1A, DOE discontinued the excavation activities. The project was delayed when excavation encountered higher-than-anticipated levels of TRU radionuclides. The state and EPA have subsequently agreed for DOE to rethink the excavation and disposal process and then expediently continue with the removal of this high-risk source. DOE has agreed to the resumption and completion of this removal activity in FY 2005.

***SNS planners expect
to host 2000
researchers/users per
year when the project
is complete.***

Spallation Neutron Source. The SNS is an accelerator-based research facility being built on a 75-acre site on Chestnut Ridge between ORNL and Y-12. Construction of the \$1.4 billion facility began in December 1999, and it is scheduled for completion in 2006. The project is approximately 82 percent complete. The design is 100 percent complete. The facility (as designed) will have 24 beam lines directing neutrons toward test material. Project planners expect to host 2000 researchers/users per year when the project is complete. The facility is not yet operational, but limited testing is being conducted on equipment as it is installed. The facility is scheduled to begin operation in

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June 2006. By around 2007-2008, the SNS is expected to generate the most intense neutron flux of any facility in the world.

Plans are beginning for a second target facility, where the neutron beams are aimed at the materials to be tested. If it is approved and funded, this second facility is expected to cost \$350 million.

According to SNS representatives, the SNS has so far provided approximately \$340 million to the Tennessee economy. The facility is expected to have 400 full-time employees when it becomes fully operational in 2006.

The division attends semiannual DOE review sessions, has periodic meetings with SNS staff members, makes site visits (including inspections of erosion and sediment controls), and reviews documents. Currently, division staff members are awaiting a draft waste management plan and a draft groundwater monitoring plan for comment and review.



Aerial view of the Spallation Neutron Source under construction on Chestnut Ridge. DOE photo

3.2.2 White Oak Creek Watershed-Melton Valley

The White Oak Creek Watershed-Melton Valley occupies about 1,000 acres of land south of and downstream of the Bethel Valley portion of the White Oak Creek Watershed. Haw Ridge separates Melton Valley from Bethel Valley. The Clinch River borders Melton Valley on the west.

Melton Valley contains many acres of burial grounds, seepage pits, contaminated floodplains, and hydrofracture wastes, but the majority of disposal activities involved the use of shallow land burial. The wastes located in this watershed originated not only from local operations, but from other sites as well. Beginning in the mid-1950s, the Atomic Energy Commission designated ORNL's solid waste storage areas as the Southern Regional Burial Grounds. From 1955 to 1963, various off-site installations sent about 10 million cubic feet of solid waste containing radioactive and hazardous substances to be disposed in this area.

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The Melton Valley Watershed has many problem contaminants, some of which are discharging into the Clinch River via White Oak Creek. These include cesium-137, cobalt-60, strontium-90, tritium, other radionuclides, TRU elements, and volatile organic compounds.

Melton Valley Watershed Interim Record of Decision. The Melton Valley Interim ROD was completed and signed by the FFA parties in September 2000. This CERCLA decision combines many independent subunits or operable units that involve soil excavations, the capping of waste disposal sites, demolition of old facilities, and the plugging and abandonment of numerous monitoring and hydrofracture wells. Remedial actions to be performed under this ROD are scheduled under the Accelerated Cleanup Plan to be completed in FY 2006. Several of the initial activities under this ROD were completed this past year, and new activities continue.

Intermediate Holding Pond Excavation. The Intermediate Holding Pond lies adjacent to SWSA 4 and White Oak Creek in Melton Valley. During early operations at ORNL, liquid radioactive waste was pumped into the holding pond after initial treatment to allow the hottest radioactive components to decay in place. Waste that did not settle out and remain in the holding pond would flow downstream into the Clinch River. Recently completed excavation and disposal of the Intermediate Holding Pond sediments has removed more than 20,000 cubic yards of radioactive contaminants from the environment.

New Hydrofracture Facility D&D. This project is part of the Melton Valley Interim ROD. The remedial action involves D&D of the New Hydrofracture building and other ancillary support systems. The action also involves the stabilization of low-level waste tank No. 13 sediments. Contaminated waste from this project is planned for disposal at the on-site CERCLA waste disposal facility. A recent spill of contaminated water from a low-level waste tank being hauled to the Environmental Management Waste Management Facility (EMWMF) for disposal has resulted in the shutdown of this operation. The incident involved the spillage of radioactively contaminated water to public highway 95 off the ORR. As a result of this spill, a significant portion of the highway required cleanup and resurfacing. The spill also resulted in DOE performing a Type B investigation to determine the cause and to develop a corrective action plan. The project will resume once the investigation is finalized and corrective actions have been taken.

Plugging of Abandoned Monitoring Wells. The 111 wells at the four hydrofracture sites in Melton Valley are currently being plugged and abandoned. All but one of these wells have been plugged. The remaining well, Hydrofracture Well #4, is associated with the New Hydrofracture facility discussed above. Plugging and abandonment of this well is now dependent upon restart of the New Hydrofracture facility closure project.

High Flux Isotope Reactor and Radiochemical Engineering and Development Center. The High Flux Isotope Reactor (HFIR) and Radiochemical Engineering and Development Center (REDC) are active facilities used for research into the effects of

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neutron interaction with various materials and for the production of medical and industrial isotopes. Targets that have been irradiated at HFIR are sent to REDC for isotope separation and subsequent packaging for shipment to the end user.

In the spring of 2001, the division formed a HFIR/REDC Review Team to increase state oversight of the HFIR and REDC facilities. For 2004, the team undertook the following activities:

- Monitored progress of HFIR upgrades (ongoing from previous years);
- Reviewed the Plutonium-238 Project to supply material that will power batteries for the NASA space program to be undertaken by HFIR and REDC;
- Conducted field trips for review of the HFIR upgrades;
- Conducted field trips for review of the Plutonium-238 Production Project and for general overview of the HFIR and REDC facilities; and



TDEC photo

Demolition of contaminated and surplus facilities in Melton Valley.

- Reviewed the HFIR Updated Safety Analysis Report in response to several occurrence reports and prepared for a field trip to the HFIR facility to review the Technical Safety Requirements document.

The division also performed periodic reviews of National Pollutant Discharge Elimination System (NPDES) and radiological discharges at HFIR.

3.3 Y-12 NATIONAL SECURITY COMPLEX

3.3.1 Upper East Fork Poplar Creek Watershed

Located between Pine Ridge and Chestnut Ridge, the Upper East Fork Poplar Creek Watershed includes the main Y-12 complex and its surrounding area. This watershed lies to the east of the Bear Creek Valley Watershed and has more than 70 known sources of contamination.

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A groundwater plume contaminated with nitrates, U-238, and other radionuclides and metals underlies the central complex area. This plume originates from the S-3 Ponds (on the divide with Bear Creek Valley Watershed) and from other sources within the complex.

The Upper East Fork Poplar Creek Phase I Interim ROD. The FFA parties signed this milestone document in May 2002. The Phase I ROD focuses on preventing contamination from moving away from source areas and on cleaning up concentrations of contamination. This strategy includes the installation of asphalt caps over mercury runoff areas, flushing of contaminated sediment from storm sewers, relining or replacement of storm sewers as needed in the west end mercury area, construction of mercury treatment facilities, removal of contaminated sediments in Upper East Fork Poplar Creek and Lake Reality, monitoring, and land-use controls. Later RODs will address additional contaminated soils and sediments, D&D of buildings, and groundwater.

3.3.2 Bear Creek Valley Watershed

Bear Creek Valley begins at a low divide west of Y-12. The watershed historically was used for disposal of wastes generated by nuclear weapons manufacturing at the plant. The primary waste streams were machining remnants of metallic uranium, solvents, nitrates, shock-sensitive and explosive chemicals, and contaminated tools and equipment. These wastes were buried in pits, poured into holding ponds, and burned. Bear Creek Valley now hosts a state-of-the-art disposal facility-the EMWMF-for CERCLA waste created by cleanup on the ORR.

3.4 EAST TENNESSEE TECHNOLOGY PARK WATERSHED

The ETTP Watershed occupies 4,600 acres, only about 1,000 of which have been affected by operations at the former K-25 site. The watershed is partially bordered on the west by the Clinch River, and its tributary Poplar Creek runs through the area.

Principal contaminants in the groundwater are volatile organic compounds, some radionuclides, and various types of metals. The most pervasive contaminants are trichloroethylene and technetium-99. Surface water contamination is not a major problem.

Various types of contamination can be found in both shallow soils and deeper soils. Shallow soils contain radionuclides, metals, and organics that can be traced back to spills, overflows, building runoff, and atmospheric releases. Petroleum products, volatile organic compounds, and some radionuclides are found in the deeper soils. This contamination is the result of waste line leaks, tank leaks, and burial grounds.

ETTP Zone 1. The ETTP Zone 1 area consists of areas outside of the main plant site (including Duct Island, the K-770 area, the Powerhouse area, ED-3, the Contractors Spoil area, and Blair Road Quarry). Because few buildings and facilities currently exist

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in this section of ETTP, Zone 1 is considered to be the area easiest to remediate. Work at Zone 1 will help define the process for remediation of the main plant area of ETTP. During FY 2001, the FFA parties developed a proposed plan for remediation that would allow for unrestricted industrial land use in the area. The ROD for Zone 1 was signed in November 2002. The FFA parties are now finalizing the post-ROD documentation, such as waste handling plans and remedial designs. Under the accelerated schedule, work is to be completed on the Zone 1 area and across the entire ETTP site by FY 2008.

K-29, K-31, and K-33 Decommissioning and Decontamination. In August 1997, DOE signed a contract with British Nuclear Fuels LLC for the D&D of three large process buildings: K-29, K-31, and K-33. These buildings were a part of the DOE gaseous diffusion process to enrich uranium at Oak Ridge. D&D work began in July 1998 at the K-33 building, with radioactive contaminant removal, waste storage, and metals recycling. The division has been overseeing this project since its beginning. As of the end of June 2004, 95 percent of the project had been completed.

Decontamination of buildings K-31 and K-33 is ongoing. The extent to which the cleanup and decontamination are being performed is such that the total radiological dose that an industrial worker would be exposed to would be limited to less than 5 mrem/year. Additionally, should the decision ever be made in the future to demolish buildings K-31 and K-33, the debris would meet the waste acceptance criteria of Envirocare, the Nevada Test Site, and the EMWMF. Most of the debris would also qualify for acceptance at the Y-12 Industrial Landfill. Because the level of contamination on floors and walls is higher than initially expected, the project completion date has slipped from sometime during calendar year 2004 to approximately July 2005.

The D&D workshop housed on the cell floor of building K-33 and utilized for the dismantlement of converters has been taken down. The supercompactor and the non-destructive assay facility are also slated for dismantlement. Should the decision be made to dispose of the supercompactor, it will be shipped to a disposal site as low-level waste.

More than 190 million pounds of low-level waste has been removed and sent for disposal to Envirocare of Utah; more than 33 million pounds of waste has been shipped for disposal to the Nevada Test Site.

D&D of ETTP Building K-1200. Project contractor East Tennessee Materials and Energy Corporation (M&EC) is responsible for removing all former uranium processing equipment and classified materials from the center and south bays of the building. Additionally, all transferable radioactive and classified contamination within the building is to be removed. In preparation for M&EC's Waste Treatment Center, all necessary maintenance on the leased areas of buildings K-1200, K-1052 and K-1052B is to be performed routinely. All D&D-related work has been completed. The centrifuge units and the mezzanine structure on the wall have been dismantled, packaged, and shipped off-site for disposal. Decontamination of floors is nearing completion. M&EC plans to use a portion of the building for storage of hazardous/classified materials in

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support of its DOE/commercial waste treatment operations. The completion date is set for sometime in June 2005.

D&D of ETPP Building K-1420. The D&D of building K-1420 began in FY 1999 at a projected cost of \$10 million. As of May 2000, the projected cost was \$12 million, and

Because K-25 and K-27 are the original gaseous diffusion facilities and are Manhattan Project Signature Facilities, there is much interest in maintaining some portions for historic significance.

the projected completion date was early 2001. However, in December 2000 a contract dispute resulted in a suspension of all work on this project. At the time of suspension, the project was approximately 90 percent complete. As of June 30, 2004, the status of this project had not changed. DOE is concluding negotiations with the bonding company to complete contract performance, including the final disposition of cleanup-generated waste.

K-25/K-27 D&D. D&D activities for the K-25 and K-27 gaseous diffusion process buildings at ETPP are being accomplished under CERCLA. To facilitate completion of ETPP closure by FY 2008, this project has been assigned a high priority within the recently developed Accelerated Cleanup Plan Agreement. Buildings K-25 and K-27 were placed into operation in 1945 to enrich uranium through the gaseous diffusion process. The buildings have been permanently shut down since 1964. Because these facilities are the original gaseous diffusion facilities and are Manhattan Project Signature Facilities, there is much interest in maintaining some portions for historic significance.

D&D activities are planned in three major phases:

- Removal of hazardous materials such as asbestos,
- Removal of process equipment, and
- Demolition of the building structures.

The first phase has now begun in building K-25, with the abatement of 45 of 63 units complete. Removed material is being disposed in the Environmental Management Waste Management Facility (EMWMF), DOE's on-site CERCLA waste disposal facility, at another appropriate disposal facility. To date, approximately 20,375 cubic yards of waste has been disposed from this facility. According to present schedules, this project will be completed by FY 2008.

Uranium Hexafluoride Cylinders. DOE stored approximately 7,000 cylinders of depleted UF₆ or its remnants at ETPP in several storage yards. The division's Radiological Monitoring and Oversight Program monitors UF₆ management. Cylinder yards are evaluated for risk to the public and environment through field measurements and inspections.

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The division cooperates with DOE and BJC to continue monitoring the radiation dose rate at the ETTP UF₆ cylinder storage yards. Dose rate measurements are taken at the perimeter fence lines. Monitoring of ambient gamma levels at the UF₆ cylinder storage yards began in April 1999 and has continued to date. The data is being used to determine if monitored areas have exceeded state or federal regulatory limits for exposure to members of the public. This data is also being used to determine if environmental concerns are warranted and what, if any, remediation actions are necessary before this property is either free released or is occupied by companies during the planned reindustrialization of ETTP.

Between January 2003 and January 2004, dose rates in excess of the 100-mrem/year state/federal exposure limit were observed at all five of the monitored cylinder yards. At these yards, the total adjusted accumulated annual dose, as measured by dosimeter, has ranged from a low of 25 mrem at the K-1066-J yard to a high of 8,257 mrem at the K-1066-L yard. Both of these values are down from last year. Specific location data has been obtained for all stations with the use of global position system instrumentation. This specific location data, along with its corresponding radiological data, will be incorporated into a computer system that allows the user to locate an individual monitoring point and view its radiological history. The ETTP cylinder yards under the dosimeter project are K-1066-K, K-1066-E, K-1066-J, K-1066-B, and K-1066-L.



A UF₆ cylinder is suspended beneath a special transport vehicle as it is placed on a flatbed trailer in preparation for removal from ETTP. TDEC photo

Plans by ETTP to prepare cylinders for yard-to-yard movement and off-site shipment will necessitate "shuffling" cylinders between various yards. Due to this activity, there have been some wide variances in the dosimeter readings from quarter to quarter. These have all been checked and correlated with redistribution of the cylinders. Plans are in place for FY 2005 to evaluate the current positions of thermoluminescent dosimeters and relocate those necessary to ensure perimeter coverage of the yards.

Division staff review quarterly reports, occurrence reports, and information from the cylinder information database and make site visits to observe cylinder yard activities. The upgrade of the K-1066-J cylinder yard was completed in 2002 under division oversight, and cylinders were relocated to the yard, where they now are in compliance with storage requirements. Cylinders in this yard are being removed as part of the transfer of cylinders to the Portsmouth gaseous diffusion facility.

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DOE achieved the FY 2004 goal of 4,005 annual inspections and 560 quadrennial inspections.

DOE began shipment in March 2004 of full depleted UF₆ cylinders to Portsmouth for conversion to a more stable form. Division staff had previously reviewed transportation plans for shipments of American National Standards Institute N14.1-compliant cylinders to be completed in 2004. As of June 2003, DOE has shipped more than 1,900 cylinders. Staff reviewed transportation plans for shipment of non-compliant cylinders to be completed in 2005. Staff participated in conference calls with representatives of agencies in the states affected by the shipping campaign, and reviewed the progress of cylinder removal at ETTP.

TSCA Incinerator. This incinerator, located at ETTP, is designed to treat mixed waste and PCBs ("mixed" waste contains both radioactive and hazardous contamination). This is the only incinerator in the United States permitted to treat mixed waste contaminated with PCBs.

With the shutdown of DOE incinerators in Idaho and South Carolina, Oak Ridge Operations' TSCA Incinerator has become a "one-of-a-kind" treatment option. In support of accelerated cleanup plans across the entire DOE complex, the current strategy is for the incinerator to remain operational until 2006.

The division's Waste Management Program monitored incinerator operations in FY 2004. During the year, the state of Tennessee approved DOE's TSCA Incinerator FY 2004 Burn Plan, including two modifications. Prior to shipment of out-of-state waste to the TSCA Incinerator, the division performs a detailed review of waste characterization data. The review also focuses on a determination of whether incineration was the only treatment option for those out-of-state waste streams. The incinerator once again operated during FY 2004 in compliance with its permits.

The incinerator performed in compliance with Maximum Achievable Control Technology parameters, which went into effect on September 30, 2003, even when the feed rates were considerably lower than in the original permit. DOE has submitted a test plan under Maximum Achievable Control Technology for review and approval by the state of Tennessee. A Particulate Matter 2.5 monitor has been procured for installation. The air permit application under Title V of the Clean Air Act is being reviewed by DOE for submittal to the TDEC Division of Air Pollution Control by September 2004. TDEC's Division of Solid Waste Management is in the process of reviewing the trial burn data for the purpose of reissuing a hazardous waste treatment permit.

3.5 WASTE MANAGEMENT

3.5.1 Oak Ridge Environmental Management Waste Management Facility

Also known as the CERCLA waste disposal facility, the EMWMF was built to dispose of the large volumes of contaminated waste generated by remedial actions on

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the ORR, a formidable and expensive disposal problem. Historically, there have been two options for this waste: package and ship it to out-of-state locations, or delay cleanup and leave the waste in the environment.

The option of leaving contamination in place is not acceptable for most sites, especially those with future uses or those that may be sources of groundwater contamination. Shipping the vast quantities of contaminated soil and debris to disposal sites in the western United States is prohibitively expensive. The ORR has long needed an on-site waste disposal facility that is properly engineered and constructed.

DOE, EPA, members of the public, and the state-through the division's Environmental Restoration Program-took part in the planning and decision-making that authorized the facility. The EMWMF is now up and operating and has received remedial action waste from several projects on the ORR.

Because of the nature of the contaminants being disposed, the EMWMF will have to be maintained essentially forever. In order to help in this endeavor and to accomplish surveillance and general maintenance, Tennessee has established a trust fund to which DOE makes annual allotments; these allotments will continue until the principal in the fund reaches \$14 million. The state plans to use revenue generated from the fund to provide surveillance and maintenance after final closure of the EMWMF. It should be recognized, however, that this fund would not cover all expenses necessary in the long term to ensure this facility protects human health and the environment. The federal government will remain responsible for assuring this protectiveness as long as EMWMF contents remain a potential hazard.

Because of the contaminants being disposed, the EMWMF will have to be maintained essentially forever.

The division has recently been very active in environmental oversight of the EMWMF. Because of unusual rain and, to some degree, a lack of adequate operational management, the facility has experienced surface-water and groundwater management problems. To date, none of the problems have caused environmental harm or violated state statutes. However, the problems are significant, and long-term remedies are being designed; some are already in place, and others will be employed in the near term. The division will continue to provide environmental oversight of this facility. It is a high priority of the state that the EMWMF be properly operated and maintained in order to ensure long-term protectiveness.

3.5.2 Solid Waste Management

The division, through its Waste Management Program, works to ensure that DOE adheres to provisions of RCRA (See Environmental Laws sidebar) and to the rules and regulations governing solid waste disposal in Tennessee.

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Oak Ridge Reservation Landfills. The principal process performed at the ORR landfills at Y-12 is the disposal of solid wastes, which must be non-hazardous, non-radioactive, and non-RCRA-regulated. DOE must use approved operations in receiving, compacting, and covering waste.

The division performs a monthly audit of DOE's landfills on the ORR. It also reviews DOE practices to ensure that radioactive waste is not disposed in these landfills. Table 1 presents the FY 2004 waste summary report of waste deposition in the four ORR landfills now in use.

Table 1. Waste Summary Report FY 2004

Landfill No.	Volume (cubic yards)
IV	84
V	44,657
VI	0
VII	45,743

Industrial Landfill IV. This industrial waste landfill operates as an approved Class II landfill in accordance with TDEC permit No. IDL-01-103-0075. Because it was opened prior to implementation of the current Class II requirement established in the TDEC solid waste processing and disposal regulation, the eastern area does not require a leachate collection system or gas monitoring capabilities. However, it has a leachate collection system in place in the western area and a gas monitoring system. Landfill IV is a classified industrial landfill.

Industrial Landfill V. Industrial Landfill V is a Class II landfill permitted under TDEC permit No. IDL 01-103-0083. The landfill receives mostly sanitary and industrial waste generated at the plants. It does accept special waste approved by TDEC. This landfill does have a leachate collection system.

Construction/Demolition Landfill VI. Landfill VI was certified closed during FY 2004 and, therefore, no waste was disposed at the landfill during the year.

Construction/Demolition Landfill VII. Landfill VII is a Class IV landfill permitted under TDEC permit No. DML-01-103-0045. This landfill is used for the disposal of demolition/construction waste and certain other TDEC-approved waste having similar characteristics.

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3.5.3 Hazardous Waste Management

In FY 2004, the division participated in the hazardous waste compliance evaluation inspection at ORNL, Y-12, and ETTP. As a result of this inspection, TDEC's Solid Waste Management Division issued a Notice of Violation to ORNL. The notice was for several unlabeled drums containing waste that had not been properly characterized.

3.5.4 Radioactive Waste Management

Low-Level Radioactive Waste. As of June 2004, the inventory of low-level legacy waste on the ORR was about 16,700 cubic meters. This does not include about 1,800 cubic meters of newly generated low-level waste in storage and approximately 3,300 cubic meters of grandfathered waste. "Grandfathered" waste refers to waste already in the possession of DOE generators. It is in various stages of characterization and is anticipated to be transferred to DOE's Environmental Management program. Since the beginning of FY 2004, DOE has reduced its low-level waste inventory by about 47 percent.

Under the Oak Ridge Accelerated Cleanup Plan Agreement, DOE will dispose all legacy low-level waste by the end of FY 2005. As part of this effort, DOE has initiated characterization, including sorting and segregation, of the legacy waste that has accumulated on the ORR.

Spent Nuclear Fuel. The division, represented by the Radiological Monitoring and Oversight Program, follows all spent nuclear fuel (SNF) issues, including inventory, storage, retrieval from below-grade storage, repackaging for shipping, shipping-cask inspection, and all other transportation issues related to SNF shipping. All the SNF on the ORR is housed at ORNL. DOE is nearly finished shipping all SNF to locations outside of Tennessee. Progress in this effort is summarized below.

Except for two shipments of Tower Shielding SNF and the HFIR SNF, all of the aluminum-clad SNF was shipped to the Savannah River Site in South Carolina during the late 1990s. The two shipments of the Tower Shielding SNF were completed to Savannah River during the second quarter of FY 2004. HFIR SNF shipments are ongoing, since that facility is still in operation.

Since the beginning of FY 2004, DOE has reduced its low-level waste inventory by about 47 percent.

All non-aluminum-clad SNF was repackaged into dual-purpose shipping/storage containers between FY 2001 and FY 2003, and those packages were made ready for shipment to Idaho National Engineering and Environmental Laboratory. Final shipping preparations were made in late FY 2003, and mock fuel handling exercises were performed. Five shipments of SNF going to the Idaho laboratory were required for the complete inventory of non-aluminum-clad SNF, and those shipments were completed in

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the first half of FY 2004. Division staff reviewed documentation and conducted several field trips in monitoring those activities.

Final preparations for removal of the MSRE fuel salts were completed in late FY 2004, and fuel salt removal was begun. The uranium will be separated, placed in interim storage at ORNL building 3019, and dispositioned with the rest of the uranium-233 material. The MSRE fuel salts will be stored at the ORNL TRU storage facility at SWSA 5 until a final disposal location is chosen.

3.5.5 Mixed Waste Site Treatment Plan

The Site Treatment Plan is a mixed-waste management tool authorized through the Federal Facility Compliance Act (see "Environmental Laws"). Mixed wastes have both hazardous and radiological constituents. The Site Treatment Plan is implemented through a TDEC Commissioner's Order because the hazardous constituents are regulated. This enforceability has usually resulted in an effective work-off of inventories according to negotiated schedules.

Five decades of nuclear weapons research and development on the ORR has left a legacy of contamination in the local and regional environment, including land and water ecosystems.

TRU radioactive wastes have only one disposal option: the Waste Isolation Pilot Plant in New Mexico. DOE's inability to obtain a RCRA permit modification from the state of New Mexico has resulted in delays in the proposed treatment schedule for ORR's TRU waste. DOE is continuing to challenge the appropriateness of the TRU milestones in the Site Treatment Plan. In FY 2004, the dispute resolution was escalated to a "Formal Status," allowing the dialogue to take place at the TDEC Commissioner's level.

In January 2004, DOE complied with the Site Treatment Plan enforceable framework in completing construction of the Melton Valley Transuranic Waste Remediation Facility at ORNL. The facility has provided a much-needed mixed waste treatment capacity. As of this report, the facility is treating supernate—the liquids left on top of tank residues—from Melton Valley low-level liquid waste tanks. In FY 2004, the facility processed and shipped 800 cubic meters of low-level (radioactive) waste to the Nevada Test Site. This meets the FY 2004 supernate treatment milestone agreed to by DOE and the state.

3.5.6 Facility Surveys

Five decades of nuclear weapons research and development on the ORR has left a legacy of contamination in the local and regional environment, including land and water ecosystems. Most of this radiological and chemical contamination was released directly from buildings and other facilities.

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In an effort to document the nature and sources of contamination, the division's Radiological Monitoring and Oversight Program conducts a Facility Survey Program (FSP). The FSP documents the following for facilities:

- Operational history,
- Physical condition,
- Past release history,
- Radioactive and chemical inventories, and
- Potential for ongoing and future releases.

The FSP also tracks demolition and construction activities on all three sites.

As facilities are examined, they are ranked according to their potential to harm the environment. Since 1994, the FSP has examined 175 facilities, 64 of which held a high potential for environmental impact. The FSP characterized four facilities in FY 2004 and found that all four posed a relatively high potential for releasing contaminants to the environment.

In many cases, the potential for environmental release is dominated by degraded or unmaintained facilities and infrastructure, such as underground waste lines, substandard sumps and tanks, leaky roofs, and peeling lead-based paints.

When facility problems are noted by the FSP, they are relayed to DOE, where corrective actions can be formulated. As corrective actions are completed, facilities are removed from the division's list of High Potential Environmental Release facilities. To date, 10 facilities have been removed.

3.5.7 Verification of Surplus Materials Release

Division staff review radiological control procedures and ensure that DOE and its contractors follow agreed policies for release of materials to the public. Under this activity, staff from the Radiological Monitoring and Oversight Program review occurrence reports when radioactively contaminated materials are inadvertently released. In addition, staff members check public auctions for adherence to release policies and conduct spot radiological surveys. Surveys of public auction items were conducted for 22 public auctions by Y-12 Surplus Sales and ORNL Surplus Sales. ETPP did not schedule any public auctions during this year.

Scrap metal is also monitored under this program. Clean scrap metal is sold under annual sales contracts at each facility. Previously, staff reviewed the scrap metal sales program at ORNL, including an inspection tour of the various scrap metal collection points. Reviews of the clean scrap metal programs at ETPP and Y-12 were completed during this year.

4.0 Regional Environment

While pollutants released from the ORR have substantially decreased over the years, concerns remain that emissions from current activities could pose a threat to public health and the environment. To help ensure that emissions from the ORR are identified and properly controlled, the TOA specifies the state shall do the following:

- Perform independent oversight and evaluation of DOE's environmental monitoring programs;
- Monitor radiation on the ORR and environs, as necessary, to detect and characterize off-site contamination and human exposure; and
- Evaluate performance of on-site control measures to prevent releases to the environment.

In response to these requirements, the division has developed programs that provide independent monitoring of all media on and in the vicinity of the ORR and oversight of DOE monitoring and control systems. Designed with the cooperation of DOE and EPA, these programs were developed to complement and verify monitoring performed by DOE's contractors.

4.1 WATER QUALITY

Activities on the ORR have contaminated more than 100 miles of surface streams and considerable (but unknown) quantities of groundwater in East Tennessee. While effluents from process waste streams contribute to this contamination, much of the pollution found in waters on the ORR can be attributed to releases from antiquated and deteriorating waste disposal, transport, and storage facilities. To a large degree, these contaminants migrate to groundwater, where they are discharged to local streams and carried to the Clinch River. While ORR contaminants are diluted by the Clinch River, evidence of them can be found downstream to Watts Bar Dam and beyond.

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Each of the division's program areas has specific responsibilities that contribute to protection of the state's water resources. These responsibilities include the oversight of DOE monitoring systems, as well as independent monitoring as necessary to verify DOE data and ensure adequate protection of the public and environment.

4.0 Oak Ridge Regional Environment

4.1.1 Drinking Water Supplies

The division continued in FY 2004 to oversee maintenance and compliance activities for the water treatment and distribution systems serving DOE's Oak Ridge facilities. This work includes the following:

- Independent monitoring of residual chlorine levels; and
- Oversight of cross-connection controls, water line repairs, and the general status of distribution systems.

The division did not detect any serious threats to worker or public safety. However, given the challenges present on the ORR-including burial grounds, contaminated soils, and contaminated groundwater-evaluation of the potable water distribution systems at the three plant sites remains an ongoing need. Noteworthy events include the following:

ORNL. The fire protection upgrade in the 6000 area was completed and put into service. Relocation of the main line in the main campus area was also completed and put into service. This was done to accommodate construction of new buildings in the main campus area.

Y-12. No significant changes occurred to the Y-12 distribution system this year.

ETTP. Continuing D&D activities have reduced the size of the distribution system at ETTP. Lines are being taken out of service and cut and capped as demolition work proceeds.

Environmental Radiation Ambient Monitoring System Drinking Water

Program. Since the Clinch River serves as a raw water source for public water supplies in the area, these utilities can potentially be impacted by radiological releases from the ORR. To address this possibility, the division arranged for area treatment facilities to be included in EPA's Environmental Radiation Ambient Monitoring System drinking water program. This program monitors drinking water from public supplies near nuclear facilities throughout the nation. In the Oak Ridge program, EPA provides radiochemical analysis of drinking water samples collected by the division at five area water supplies:

- Kingston Water Treatment Plant,
- Gallaher (K-25) Water Treatment Plant,
- West Knox Utility,
- City of Oak Ridge (Y-12) Water Treatment Facility, and
- Anderson County Utility District.

The division arranged to include area treatment facilities in EPA's drinking water program.

A large proportion of the radioactive contaminants transported off the ORR in surface water enters the Clinch River by way of White Oak Creek, which drains the ORNL complex and associated waste disposal areas. When contaminants carried by White Oak

4.0 Oak Ridge Regional Environment

Creek and other ORR streams enter the Clinch, their concentrations are significantly lowered by the dilution provided by the river. Contaminant levels are further reduced in finished drinking water by conventional water treatment practices used by area utilities. Consequently, the levels of radionuclides and other contaminants measured in the Clinch and at area water supplies are far below the concentrations measured in White Oak Creek and many of the other streams on the ORR.

Since the Gallaher Water Treatment Plant is the closest water supply downstream of White Oak Creek (approximately 6.5 river miles), this facility would be expected to exhibit the highest concentrations of radioactive contaminants of the five utilities monitored in the program. Conversely, the Anderson County Facility (located upstream of the reservation) would be expected to be the least vulnerable to ORR pollutants. Based on the data collected in the Oak Ridge Environmental Radiation Ambient

Monitoring System program, the above appears to be the case. However, results for the Gallaher facility and the other sites in the program have all remained well below applicable drinking water standards.

Results for the facilities have all remained well below applicable drinking water standards.

Data received from EPA includes the results of gross alpha, gross beta, and strontium-90 analysis performed annually on a composite of quarterly samples from each facility. It also includes the results of quarterly tritium analysis. A brief summary of the data received since the Oak Ridge program began in 1996 is provided below.

- All results for gross alpha analysis were below 0.5 picocuries per liter (pCi/L), compared to a drinking water standard of 15 pCi/L.
- The highest gross beta result (3.86 pCi/L) was reported for the Gallaher facility, which averaged 3.33 pCi/L. The standard for beta emitters depends on the specific radionuclides present, but radionuclide-specific analysis is generally not required at gross beta levels below 50 pCi/L.
- Of 20 composite samples analyzed for strontium-90, the only results reported above detection limits were for samples taken at the Gallaher Facility. These results indicate three of the four samples analyzed from the facility had low, but detectable, amounts of the radionuclide. The average result was 0.64 pCi/L, and the data ranged from 0.29 to 0.99 pCi/L. The drinking water standard for strontium-90 is 8 pCi/L.
- Of 152 tritium results reported for the five Oak Ridge treatment plants, only 22 were above detection limits. Of the results above detection limits, 19 were for samples taken from the Gallaher Facility. The results for tritium at the Gallaher Facility ranged from undetected to 1,000 pCi/L and averaged 311 pCi/L. The drinking water standard for tritium is 20,000 pCi/L.

4.0 Oak Ridge Regional Environment

4.1.2 Groundwater

Eighty-five percent of the ORR has not been developed, and most of the groundwater under these areas has not been contaminated and should be protected. Groundwater in and adjacent to industrially developed areas is generally in very poor condition or in danger of being degraded through expansion of contaminant plumes. In most cases where contaminated groundwater has migrated off-site, restrictions on groundwater use are communicated to non-DOE land users. The Clinch River ultimately dilutes many of the groundwater discharges from springs near watercourses on DOE and TVA property.

The division's groundwater programs range from a review of DOE efforts to independent sampling. The division oversees the plugging and abandonment of monitoring wells on the ORR, samples off-site residential drinking water wells, and helps collect and evaluate data for DOE's Oak Ridge Environmental Information System. The division also reviews documents released by DOE under CERCLA, NEPA, and other programs that may influence groundwater-cleanup or groundwater-use decisions on the ORR.

The state has no approved groundwater classification rules, and this has complicated cleanup on the ORR. The use of groundwater classification has been delayed because Tennessee's comprehensive state groundwater protection program has not gained approval by EPA. EPA will not recognize the promulgated classification procedure until the comprehensive state groundwater protection program is approved. The state's plan continues to be under consideration by EPA.

The state has no approved groundwater classification rules, and this has complicated cleanup on the ORR.

Y-12. Groundwater is contaminated beneath the Y-12 plant site, with plumes extending both east and west. Groundwater in the vicinity of Y-12 contains metals (including mercury), solvents, and uranium. A carbon tetrachloride plume extends east of Y-12 off the reservation beneath Union Valley. The groundwater plume west of Y-12 emanates from the former S-3 ponds and is joined by contaminants from disposal areas in Bear Creek. The S-3 ponds, which were closed with contaminants in place, produce a nitrate plume with significant amounts of uranium. Y-12's waste area in adjacent Bear Creek Valley contains uranium, PCBs, and solvents, some of which are present in secondary sources where these denser liquids sank deep in the cavernous bedrock below the water table.

Disposal sites on Chestnut Ridge are grouped with the Y-12 hydrogeologic regime. The groundwater plume beneath Chestnut Ridge can be detected in springs east of the reservation at the University of Tennessee Arboretum.

This year marked an end to dryer conditions for the most part, and many springs and seeps have returned to flow after several years of no flow. The most notable consequence predicted by the division groundwater staff is impacts on the EMWMF in Bear Creek Valley. Water levels have come to within 2 feet of the liner system. DOE

4.0 Oak Ridge Regional Environment

must provide an engineering solution to this groundwater elevation problem. The division will continue to measure groundwater elevations to verify that they are effectively lowered.

ORNL. ORNL has significant groundwater contamination both under the main plant site and in Melton Valley. At ORNL, radionuclides contaminate groundwater in the main building area, with strontium-90 being the major concern. Groundwater beneath the ORNL maintenance facility contains solvents. Waste from ORNL operations disposed in adjacent Melton Valley includes tritium and many radionuclides, as well as chemicals from experiments. The South Campus Facility on the east end of Bethel Valley has a plume of solvents that have been detected in springs close to what is now city of Oak Ridge property.

ETTP. ETTP has contamination under the main plant and at adjacent smaller sites. The groundwater plume is also discharging off the ORR, mainly through springs onto TVA property. Groundwater at ETTP has considerable quantities of solvents and measurable amounts of uranium and other radionuclides, such as technetium-99.

Residential Groundwater Sources. The division has altered the residential well sampling protocol. Composite samples are being used to facilitate dose estimation and comparison to drinking water standards. These test results indicate that the water in these sources is not currently affected by DOE operations. Most homeowners interviewed are satisfied with groundwater quality, and the quality of water from these sources appears to be good.

Springs and Seeps. Sampling of springs and seeps has been ongoing since 1992. Samples are taken at different times of the year from springs and seeps both on and off the ORR. Springs and seeps provide exit pathway monitoring points, some close to burial grounds and others some distance away. This program continues to look for new springs and seeps to sample. The division sampled approximately seven springs in the fall of 2003 and approximately four more in the spring of 2004. Due to increased rainfall, many previously dry springs could be sampled this spring and summer.

Sampling of springs provides insight into how contaminants travel in groundwater. Springs in Bear Creek Valley downgradient from the Bear Creek burial grounds continue to be contaminated by radiochemical, metal, and volatile organic constituents. Several springs at K-25, Y-12, and ORNL are impacted as well. Volatile organics, nitrates, and gross alpha and gross beta activity are the contaminants of greatest concern.

Two off-site springs east of Y-12 are of special interest because they represent direct pathways onto public areas. The University of Tennessee Arboretum spring "Bootlegger" did not show volatile compounds as it has in the past, possibly due to the diluting effects of high rainfall this spring. A Union Valley spring had elevated levels of volatile organic compounds. These springs have direct groundwater pathways from contaminated areas associated with Y-12.

4.0 Oak Ridge Regional Environment

Some springs at ETTP show elevated volatile organic compounds and radionuclides. ORNL springs during this sampling period did not have elevated levels, but some of these springs have in the past shown elevated levels of radionuclides.

The levels of contaminants are low, with some exceptions near waste sites, and the general quality of groundwater on the ORR is good. The fact that contaminants can still be measured at fair distances from some sources, however, emphasizes the need to protect the remaining clean groundwater on the ORR from spreading contaminant plumes.

Plugging and Abandonment of Wells. There are more than 4,000 monitoring wells and borings on the ORR. This project consists of requesting and reviewing data on ORR wells that will be-or have been-plugged and abandoned. With the exception of RCRA and Underground Storage Tank regulations, the state has no specific regulations concerning the plugging and abandonment of monitoring wells unless it can be demonstrated that the wells are contributing to pollution. A total of 111 wells were plugged at the ORNL hydrofracture site in 2003 as part of the remediation of that project. Division staff have observed field activities and helped review plans for these projects.

Underground Storage Tanks. The division conducts oversight of the underground storage tank program on the ORR. In FY 2004, the division tracked sites that have been integrated into the CERCLA cleanup program.

Groundwater Strategy. DOE is drafting a strategy to address remediation of the groundwater plumes. The following general topic areas for a strategy are being addressed: problem formulation, uncertainty management, technology choices and performance objectives, and stewardship.

The division would like to see the conceptual model of ORR groundwater updated to include the complexities of the geology. Aquifers in soluble carbonate rocks are widespread on the ORR. These areas have springs, sinkholes, caves, and crevices that collectively are termed "karst." Karst aquifers transmit contaminants in a rapid and unpredictable manner, making it difficult to investigate and clean up groundwater. The flow of groundwater within the less permeable shale rocks needs to be re-evaluated as well.

The division would like to see the conceptual model of ORR groundwater updated to include the complexities of the geology.

4.1.3 Surface Water

Surface Water Sampling. The division's Environmental Monitoring and Compliance Program sampled surface water at 29 sites in FY 2004. Twenty-five of these were chosen to detect contamination from DOE. The other four are located upstream from the ORR and serve to provide background data.

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The sites were sampled twice in FY 2004, and results will be published in the April 2005 Annual Monitoring Report, available to the public from the division. Samples were analyzed, and the results were compared with Tennessee Water Quality Criteria, a state water quality standard published by TDEC and based on the Clean Water Act. The division has not observed substantial concentrations of pollutants coming from the reservation.

Although the state has found that White Oak Creek is not supporting its designated uses under the Water Quality Criteria, the creek does not alter the designated use of the Clinch River. This is because the Clinch is a much larger stream and, therefore, dilutes contaminants from White Oak Creek.

Bear Creek Uranium Study. Over the years, millions of pounds of uranium have been disposed in ponds and shallow unlined trenches in Bear Creek Valley at Y-12. Often placed within or below the water table, the uranium and associated contaminants migrate into groundwater, then through the valley along complex pathways that change seasonally and in response to rain. Dominated by the well-developed karst drainage of the Maynardville Limestone, these flow paths have proven difficult to characterize, despite numerous studies in the past.

To gain a better understanding of the sources, transport, and fate of the uranium and other contaminants in the waters of the valley, the division began collecting samples along Bear Creek, its tributaries, and associated springs in 2001. Data from the project indicates most of the uranium in Bear Creek is delivered along discrete, low-volume, high-concentration flow paths during the wetter parts of the year. Once in the creek, uranium follows the mixed surface and subsurface drainage of the Maynardville Limestone through the valley. In this respect, the water in Bear Creek is both lost to and recharged by the aquifer beneath. For example, Bear Creek as a whole can be observed during base flow descending through an opening in the bedrock (a

The water in Bear Creek is both lost to and recharged by the aquifer beneath.

swallet) into the aquifer, only to resurface in springs further downstream. While most of the uranium carried into the subsurface re-emerges in the gaining sections of the creek, a portion appears to be lost to the deeper aquifer, as evidenced by data obtained from deep wells in the valley. The largest source in the valley is the Bear Creek Burial Grounds, where more than 40 million pounds of depleted uranium was disposed in shallow, unlined trenches during operations. Many of these trenches extend below the water table, as evidenced by historical photos showing wastes inundated by groundwater. Current releases are believed to be transported by shallow groundwater and stormwater runoff to local streams that then carry the contaminants to Bear Creek and down the valley. If not mitigated or remediated, these releases, along with uranium daughter products, can be expected to continue to spread contamination until the uranium source is exhausted (a very long time).

While the burial grounds contain the largest quantity of uranium disposed in the valley, groundwater flowing through the area known as Boneyard/Burnyard has been

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responsible for the largest releases to date. Contaminants migrating from Boneyard/Burnyard in the groundwater are discharged to North Tributary 3, which carries them to Bear Creek. To reduce the amount of uranium entering Bear Creek from the Boneyard/Burnyard, remedial activities during 2002 and 2003 rerouted groundwater flowing through the area and excavated a large portion of the uranium wastes and contaminated soils associated with the site. According to estimations made by DOE's contractors, the actions should have reduced the amount of uranium in Bear Creek by 70 percent. Data collected in the program after the effort indicates the amount of uranium carried by North Tributary 3 decreased, but the amount of uranium in Bear Creek itself increased. Based on observations made at the site by staff, it is believed the increase may have been due to contaminants carried to the creek by surface runoff from areas excavated during the remediation.

4.1.4 Water Pollution Control

National Pollutant Discharge Elimination System (NPDES) Compliance. Division Waste Management staff monitored the various phases of the ORR wastewater treatment facilities' operations, their radiological effluents, their potential impacts to water quality both on and off the ORR, and their possible impacts to human health and the environment. The staff reviewed monthly discharge monitoring reports for reported noncompliance with NPDES permits at ETTP, ORNL, and Y-12. The official copies of these permits are held by the TDEC Division of Water Pollution Control. Radiological NPDES data as reported in discharge monitoring reports was periodically reviewed and evaluated to determine the effectiveness of DOE's water pollution control program in protecting the waters of the state from radioactive contaminants.

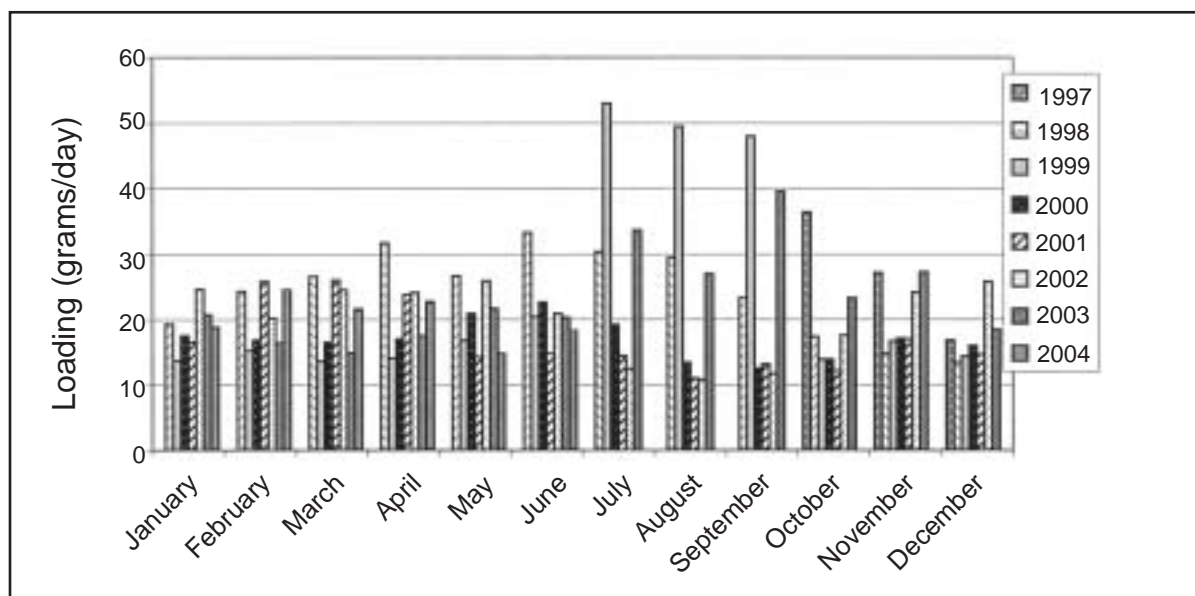
Division staff coordinated with the Division of Water Pollution Control concerning the issuance of NPDES permits. Potential Radiological Monitoring Plan requirements were discussed.

Division staff accompanied Division of Water Pollution Control personnel during an inspection of ORNL. No significant problems were noted from this inspection.

The staff continued to monitor levels of mercury in East Fork Poplar Creek at Station 17, which is at the Y-12 boundary (see Figure 1). A 1999 TDEC consent order mandates management of mercury concentrations in East Fork Poplar Creek. DOE has been unable to achieve an interim guideline of 5 grams per day (averaged over 3 months).

Aquatic Resource Alteration Permits and Wetlands Protection. The division assisted DOE and the state Water Pollution Control Division, Knoxville Environmental Assistance Center, in review of Aquatic Resource Alteration Permits for construction and maintenance projects on the ORR. The division's involvement and recommendations, including site visits and CERCLA documentation review, facilitated and streamlined permitting decisions. The official copies of the permits are held by the Water Pollution Control Division.

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TDEC graphic

Figure 1. Mercury loadings for East Fork Poplar Creek at the Y-12 boundary, Oct. 1997-Jan. 2004

Division staff inspected erosion and sediment control practices for new construction sites on the ORR, including the White Oak Creek monitoring station at ORNL, upgrades to the ORNL water distribution system, and the new purification facility at Y-12.

In addition, division staff continued to inspect erosion and sediment control practices for new construction sites at the Horizon Center at ETP. Improper erosion control measures were noted and communicated to DOE and the state Water Pollution Control Division, Knoxville Environmental Assistance Center.

Biosolids Application Program. This program is an agreement between DOE and the city of Oak Ridge to allow the city to spread class B sludge from the municipal sewage treatment plant on ORR property. In FY 2004, division staff attended meetings with DOE, the city, and DOE contractors. In early November 2003, TDEC's Division of Solid Waste approved the disposal of non-Class B sludge from the city of Oak Ridge as special waste at the Y-12 landfills. This arrangement will continue until renovations of solids-processing equipment at the treatment plant have been completed.

Toxicity Biomonitoring. The division did not perform independent toxicity biomonitoring tests of DOE discharges in 2003 and 2004. The division did, however, review biomonitoring reports submitted by DOE to TDEC and the draft DOE 2002 Annual Site Environmental Report.

DOE-performed testing indicated that the monitored outfalls at all three DOE sites complied with the biotoxicity conditions of their NPDES discharge permits.

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4.2 AIR QUALITY

Historically, air emissions from DOE activities on the ORR have been believed to be a potential cause of illnesses affecting area residents. While airborne emissions have decreased with the termination of many earlier operations on the ORR, current processes (e.g., incineration of radioactive wastes, production of radioisotopes, nuclear reactor operations, and remedial activities) continue to pose a threat to the local air quality. As a consequence, the division has developed air monitoring programs to assess the impact of ORR air emissions on the surrounding environment and the effectiveness of DOE controls and monitoring systems. Although the division has periodically measured fugitive releases from cleanup activities, these releases and permitted releases have not exceeded air quality criteria.

4.2.1 Ambient Air Monitoring for Radionuclides

To address the monitoring of radiological air emissions required by the TOA, the division has developed three integrated, but distinct, air monitoring programs. Together, the projects collect samples from 19 air samplers placed at selected locations on and near the reservation. The perimeter and fugitive air programs focus on monitoring exit pathways, non-point sources of air emissions, and sites of special interest. The division's participation in EPA's Environmental Radiation Ambient Monitoring System supplements the other two programs and provides independent verification of both state and DOE monitoring data.

In addition to the above, the division is conducting a pilot study designed to assess the feasibility of monitoring radon emissions on the reservation. The project was prompted by a concern that the disposal of millions of pounds of uranium in ORR burial grounds may have resulted in elevated radon levels (radon is produced by the natural decay of radionuclides in the uranium decay series).



TDEC photo

Division staff collect results from an air monitoring station.

Perimeter Air Monitoring Program. The Perimeter Air Monitoring Program uses 12 low-volume air samplers to monitor contaminants at locations believed to be the

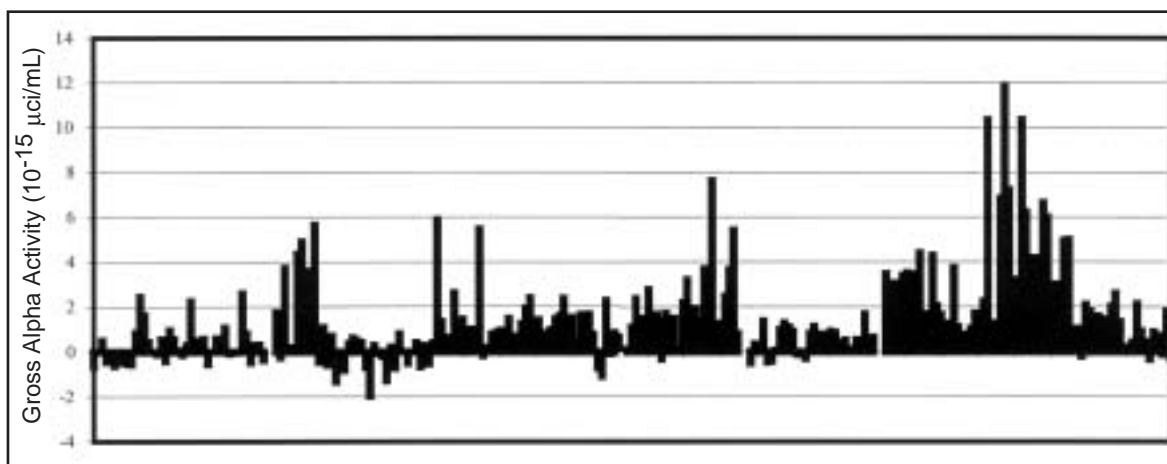
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most likely pathways for airborne pollutants to exit the ORR. To a large degree, data collected in the program has been consistent with background measurements, given natural fluctuations expected in the quantities measured. Slightly elevated results (above background measurements) have been observed at stations near Y-12, but the levels measured are well below standards provided in the Clean Air Act. It is believed the current campaign at Y-12 to modernize operational facilities and tear down unneeded buildings may have caused the slightly elevated results.

Fugitive Air Monitoring Program. The Fugitive Air Monitoring Program uses a portable high-volume air sampler to monitor diffuse (non-point) radiological emissions. Since the unit is mobile, the fugitive air sampler can be placed near locations where there appears to be a potential for the release of contaminants due to localized conditions (e.g., building demolition).

Since August of 1999, the portable sampler has been stationed between the K-31 and K-33 process buildings at ETTP. Together, these buildings cover more than 47 acres and contain more 150 acres of floor space. During operations, the two facilities were an integral part of the uranium enrichment process, and both are known to be contaminated with uranium isotopes, technetium-99, and TRU radionuclides. The facilities are currently being cleaned up in association with a CERCLA action memorandum issued in 1997.

From 1999 through 2003, results from fugitive air monitoring at the K-31/K-33 facilities have risen from background levels to measurements up to five times these levels. Individual results have fluctuated, but the data indicates an overall trend upward since 2001. Figure 2 depicts the concentrations measured at the K-31/33 facilities in excess of background measurements taken at Fort Loudoun Dam. Negative values in the chart represent instances where the background measurements exceeded the ETTP



TDEC graphic

Figure 2. Gross alpha activities reported for monitoring performed at the K-31/K-33 process buildings minus background Concentrations collected at Fort Loudoun Dam (August 4, 1999–June 16, 004).

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measurements, which is not uncommon on the reservation in the absence of man-made influences.

After DOE's contractor responsible for the project was notified of the trend in 2002, the results declined to near background levels, then began to rise again the following spring. In discussions of the issue, staff were advised the 2003 increase was believed to be a consequence of work being performed in the K-31 building near the division's monitor. The results subsequently dropped, indicating the cause of the elevated results was found and mitigated. While the data for 2003 was above background levels, it does not appear standards specified in the Clean Air Act were violated.

Environmental Radiation Ambient Monitoring System. This EPA program is composed of a national network of monitoring stations that regularly collect samples of air, water, and milk for radiochemical analysis. Historically, this network has been used to track environmental releases of radioactivity from nuclear weapons tests and nuclear accidents. In response to division requests and an initiative to incorporate site-specific monitoring into the program, EPA agreed to locate five of its air monitors on the ORR. These monitors have been in continuous operation since 1996.

Samples are collected from each of the monitoring stations twice weekly by division staff and mailed to EPA's National Air and Radiation Environmental Laboratory for analysis. The laboratory performs gross beta analysis on each sample and gamma spectrometry on samples where the beta results exceed 1 picocurie per cubic meter. In 2003, none of the gross beta results reported exceeded this screening level.

Radon Monitoring Project. Radon is a colorless, odorless gas formed by the normal radioactive decay of radionuclides in the uranium decay chain. As radon decays, alpha radiation is released and radioactive daughter radionuclides are produced. Since radon is a gas and the daughters (metals) tend to attach to airborne particles, exposures to the radionuclides present an inhalation hazard, believed to be the second major cause of lung cancer in the United States (smoking is first). Over the years, more than 40 million pounds of uranium has been disposed in shallow unlined trenches on the ORR, raising a concern that radon and its progeny could be present at hazardous levels. To evaluate associated hazards, the division began a pilot study in the summer of 2001 designed to assess the feasibility of monitoring radon levels at ORR waste disposal sites. For this study, radon detectors were placed at background locations and over uncapped portions of the Bear Creek Burial Grounds near Y-12.

Results from the initial study indicated the radon concentrations could be measured and suggested the burial grounds have areas where the radon levels are above background concentrations. However, various problems were encountered during the effort. Several of the detectors were damaged (presumably by insects or small mammals), three detectors were lost or displaced by mowers, and uranium wastes were discovered on the ground surface at one of the locations being monitored. In 2003, it was decided to continue the study but deploy the detectors during the winter/spring months in an effort to avoid some of the problems encountered in 2001.

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In general, ambient radiation levels follow seasonal trends, due to the influence of natural phenomena that control the concentrations of radiation in the environment. In regard to radon, wind movement, precipitation, barometric pressure, and temperature each play a role in these variations, and relatively large seasonal fluctuations are considered normal. In 2001, the samples were deployed during the summer months, when radon levels are expected to be at their highest. The second set of detectors was placed over the burial grounds from February to June of 2003, a period when radon levels are typically much lower. An order of magnitude decrease in the background sample measurements in 2003 indicates the major influence on the results can be attributed to natural seasonal variations that control the amount of radon released through the soils into the atmosphere. Table 2 summarizes the data from the two sampling efforts, in units of picocuries per liter.

Table 2. Summary of results for radon samples taken at the Bear Creek Burial Grounds in summer 2001 and spring 2003

Location/Year	Season	Range (pCi/L)	Average (pCi/L)	Median (pCi/L)
Background 2001	Summer	3.8-13.8	9.5	11.0
Background 2003	Spring	0.4-2.1	1.2	1.1
Bear Creek Burial Ground 2001	Summer	2.8-57.6	15.0	11.0
Bear Creek Burial Ground 2003	Spring	0.6-4.5	1.6	1.25

Despite the difference in concentrations, there were notable similarities in the results contained in the two data sets: (1) both indicated radon above the burial grounds could be measured; (2) localized areas within the burial grounds exhibited higher radon levels than the background results; (3) the median values for the background locations and the burial grounds were relatively close; and (4) the average concentration from the burial ground measurements was skewed higher than the average for the background measurement by one or two results. Overall, the results collected indicate radon levels over the burial grounds can be measured using the technique developed for the project, and localized areas within the burial grounds had radon levels above background concentrations. As a consequence, the program was continued into 2004, but associated data was not available at the time of this report.

4.2.2 Ambient Gamma Monitoring (Oak Ridge Reservation-Wide)

Gamma radiation is emitted by various radionuclides that have been produced, stored, and disposed on the ORR. Associated contaminants are evident in ORR facilities and the surrounding environment. To assess the risks posed by these contaminants, the division uses continuous gamma monitors and environmental dosimeters to measure radiation exposure rates and doses from external radiation at selected locations on and near the ORR.

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The amount of radiation released by a facility is restricted by both state and federal regulations. While the limits on radiation exposures differ somewhat between the regulatory agencies, DOE, the Nuclear Regulatory Commission and the state all share a primary dose limit for members of the public of 100 millirem per year (mrem/year). The state and Nuclear Regulatory Commission also limit the maximum dose in an unrestricted area to 2 mrem in any one-hour period. Since there are no agreed-upon levels where exposures to radiation are without risk, all three agencies require exposures to be as low as reasonably achievable.

The public dose limit includes the dose from both external exposures (due primarily to gamma radiation) and internal exposures (due to ingestion, inhalation, injection, or absorption of radionuclides). The gamma monitoring programs address only external exposures. Any contributions to the public dose from internal exposures would be in addition to the doses reported for the gamma monitoring programs.

The actual dose an individual receives at any given location from external sources of radiation depends on the intensity and duration of the exposure. The doses of radiation reported in the division's Ambient Gamma Monitoring Programs would be for an individual who remained at the monitoring station 24 hours a day for a year (8,760 hours) as measured by environmental dosimeters. Since this is unlikely to be the actual case, the doses should be viewed as the maximum external dose an individual would be expected to receive at each location.

Where exposure rates are expected to fluctuate significantly over a short period of time or there is a potential for the accidental release of radioactive contaminants, the division uses continuous-exposure-rate monitors to record radiation levels at much shorter intervals than are feasible with the dosimeters (e.g., minutes). These results are compared to the state's limit for the maximum dose to an unrestricted area, 2 mrem in any one-hour period. Results from both techniques are used to assess compliance with the "as low as reasonably achievable" principle and the effectiveness of remedial activities.

The monitoring locations and associated results can be roughly organized into the three following categories.

Sites off the ORR. In 2003, the annual doses reported for locations off the reservation (e.g., in residential areas) were all well below the 100 mrem/year primary dose limit for members of the public and to a large degree below the detection capabilities of the environmental dosimeters (1 mrem). Exposure rates measured at the background station averaged 8.4 microrem (μ rem)/hour and ranged from 7 to 13 μ rem/h, which is consistent with measurements taken on the reservation at sites unimpacted by DOE activities.

Sites on the ORR Potentially Accessible to the Public. Since access to the reservation has in the past been predominantly restricted to employees of DOE or their contractors, locations within the fenced areas of the reservation have traditionally been

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considered inaccessible to the general public. However, reindustrialization of portions of the reservation has resulted in an influx of workers employed by businesses not directly associated with DOE operations. These individuals are considered members of the general public, so several of the sites within the boundaries of the ORR become problematic. For example, relatively high doses of radiation were measured at ETTP in the vicinity of the K-1420 building (802 mrem/year) and the UF₆ cylinder storage yards (1,889 mrem/year). Under current conditions, these sites are potentially accessible to workers not employed by DOE or its contractors.

Sites within Access-Controlled Areas of the Reservation. While conditions could change, other sites monitored that reported results appreciably above the primary dose limit are located within access controlled areas of the reservation. These sites are subject to remediation in accordance with the provisions of CERCLA and the FFA. While it is beyond the scope of this report to address each of these sites individually, several merit comment.

4.2.3 Specific Sites within Access-Controlled Areas

The Cesium Forest [Station 32 (15,325 mrem/year)]. The highest annual dose reported for 2003, 15,325 mrem/year, was from a dosimeter placed on a tulip poplar tree in an area at ORNL known as the Cesium Forest. In 1962, a group of trees at this location were injected with cesium-137 as part of a study of the isotope's behavior in a forest ecosystem. Based on the dosimetry results, it appears a significant amount of the cesium remains in the trees and local environment. In 2003, the quarterly dose measured more than doubled (2,145-4,753 mrem) after the dosimeter was repositioned on the tree in the third quarter. As a consequence, the annual dose increased from 10,136 mrem/year in 2002 to 15,325 mrem/year in 2003. This area is not accessible to the general public.

Corehole 8 Remedial Action, the North Tank Farm [Station 41(258 mrem/year)]. The North Tank Farm is located near the center of ORNL's main campus, across the street from the cafeteria. In the past, a number of underground storage tanks were emplaced at this location to store and/or treat radioactive and hazardous wastes. In the late 1990s, one of these tanks, W-1A, was discovered to be the source of the Corehole 8 groundwater plume. The Corehole 8 Plume covers a large area to the west of the site, where associated contaminants discharge to First Creek and are transported downstream to White Oak Creek and the Clinch River. Contaminants include strontium-90, americium-241, plutonium-238, 239, 240, and curium-244.

DOE contractors began removing W-1A and adjacent soils in 2001, but the removal action was suspended and the excavation covered after radioactivity was encountered at levels much higher than the remedial contractor had estimated. Before the removal action began, annual dose measurements fluctuated around 100 mrem/year at Station 41, located next to a sidewalk adjacent to the site. In 2001, when the action began, the dose reported rose to 463 mrem/year as contaminants previously shielded by soils were uncovered. The dose for 2002 rose to 540 mrem/year (probably because equipment was

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moved that had been shielding the dosimeter). The dose reported for Station 41 in 2003 was 258 mrem/year, but the levels decreased from 118 mrem reported for the first quarter to 31 mrem reported for the last quarter.

The 3513 Waste Holding Basin [Station 30 (1,358 mrem/year)]. From 1944 to 1976, the 3513 Waste Holding Basin served as a settling pond for ORNL effluents prior to their release to White Oak Creek. Consequently, sediments at the bottom of the basin accumulated significant amounts of radioactive materials. These wastes included an estimated 200 curies of cesium-137, 30 curies of strontium-90, and 5 curies of cobalt-60, europium-154, plutonium isotopes, americium-241, and curium-244. A CERCLA ROD issued in 1997 provided for the removal and disposal of the contaminated sediments in the 3513 Impoundment and the adjacent 3524 Equalization Basin (which historically also received radioactive wastes).

In order to measure the effectiveness of this action, division staff attached an exposure rate monitor to a tree located approximately 28 feet from the 3513 Impoundment in 1999 (prior to any remedial activities). From January 11, 1999, to December 30, 2003, the dose rates measured at the basin averaged 69 $\mu\text{rem}/\text{hour}$ and ranged from a high of 271 $\mu\text{rem}/\text{hour}$ to a low of 11 $\mu\text{rem}/\text{hour}$. The annual doses measured at the site using environmental dosimeters ranged from a high of 3,020 mrem/year in 1999 to a low of 1,358 mrem/year in 2003 (the last quarter of 2003 had decreased to 45 mrem). Figure 3 plots the dose rates recorded at the 3513 Basin from January 11, 1999, to December 30, 2003, along with background data collected at Fort Loudon Dam during the same period.

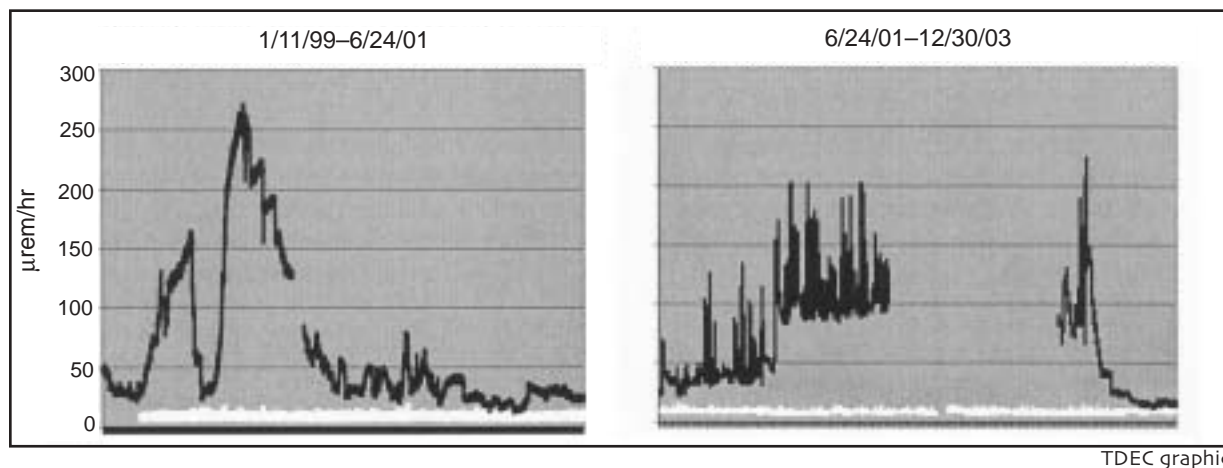


Figure 3. 2003 Results of gamma exposure rate monitoring (converted to dose rates) at the 3513 Waste Holding Basin (black line) and background measurements taken at Fort Loudoun Dam (white line).

The state dose limit to an unrestricted area is 2 mrem (2,000 μrem) in any one-hour period. The state dose limit for members of the public is 100 mrem in a year.

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To a large degree, fluctuations in the exposure rates measured at the basin can be attributed to changes in the water level in the impoundment. That is, the water in the basin shielded gamma radiation emitted by the contaminants contained in the sediments. Increased water levels during the wetter months enhanced this effect and provided shielding to previously exposed sediments at the basin perimeter, resulting in lower exposure rates. The peak that can be noted in Figure 3 during summer 1999 was due to the lowering of the water level to repair a seep that was observed in the berm that separates the basin from White Oak Creek. In 2001, DOE contractors began removing sediments from the 3513 Basin. The sediment removal process continued through 2003, but the gamma monitor had to be removed in July 2002 for routine maintenance and calibration. The gamma monitor was returned to the site in June 2003, as the remediation was nearing completion. The remainder of the sludge was removed and the basin filled and capped. Measurements taken during this period ranged from 0.012 to 0.223 mrem/hour and averaged 0.049 mrem/hour. Since completion of the project, the measurements have continued to decline, averaging approximately .016 mrem/hour for the last quarter of 2003.

The ORNL Coal Yard Environmental Restoration Storage Area (Stations 88 and 89). As previously noted, sludge excavated from the 3513 Waste Holding Basin contained high levels of cesium-137, along with various other radionuclides including transuranics. Consequently, the sludge exhibited high levels of radioactivity. While in the basins, this radioactivity was attenuated by the water above it, reducing the exposure levels at the surface. Once removed from this shielding, the exposure levels associated with the sludge substantially increased. As part of the remedial action, the sludge taken from the basins was mixed with cement, formed into large concrete monoliths, and stored in locations across the ORNL campus.

To evaluate hazards that might be associated with the sludge, staff placed a continuous-exposure-rate monitor at the boundary of the radiation control area surrounding sludge monoliths at the Environmental Restoration Coal Yard Storage Area. Measurements taken in December 2002 with the exposure-rate monitor averaged 1,740 μ R/hour. The state's dose limit for unrestricted areas is 2 mrem in any one-hour period, which would be equivalent to an exposure to gamma radiation of 2,000 μ R. As a consequence, the exposure rate monitor was left at the location, along with one of the environmental dosimeters. Even though the monoliths were removed during the monitoring period, the dose (2,388 mrem) was the highest reported for the quarter. In the absence of the monoliths, the dose at the site fell to 16 mrem the following quarter.

After the monoliths were removed, the radiation area at the coal yard was reduced to the size necessary to surround materials that had been contaminated during the Corehole 8 Remedial Action. A dosimeter was placed near the new boundary for this radiation area in October 2003. The dose reported for the quarter was 2,669 mrem. This was the second highest measurement reported for the quarter (the tree in the Cesium Forest was the highest).

Environmental Management Waste Management Facility. The EMWMF was constructed in Bear Creek Valley (near Y-12) to dispose of wastes generated by

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CERCLA activities on the ORR. The facility relies on waste profiles provided by the waste-generating organizations to characterize waste disposed in the facility. This profile is based on an average of contaminants in a waste lot. Since the size of waste lots can vary from a single package to many truckloads of waste, the averages reported are not necessarily representative of each load of waste transported to the facility. That is, some loads may have highly contaminated wastes, while other loads may contain very little contamination.

To get an idea of the variability in radioactive waste disposed at the EMWMF, one of the gamma monitors was secured at the facility's check-in station on August 27, 2002. Each truck transporting waste for disposal is required to stop at this location while the vehicle and waste are weighed. For 2003, the measurements taken at the EMWMF ranged from 0 to 1,612 $\mu\text{R}/\text{hour}$ and averaged 18 $\mu\text{R}/\text{hour}$.

As might be expected, the highest measurements recorded were for sediments taken from the 3513 Basins at ORNL. Because of the radiological characteristics of the waste, it had initially been intended for disposal at the Nevada Test Site. However, prior to shipment, a rule change at the Nevada Test Site resulted in the wastes being rejected because of the presences of PCBs. The sediments were subsequently accepted by the EMWMF for disposal. Measurements taken at the EMWMF weigh-in station when the sediments were delivered for disposal were up to three times higher than those of any other wastes previously monitored entering the facility.

4.2.4 Air Pollution Control

Review of Permitted Air Emissions Sources. The division conducted periodic reviews of air permitting documentation for ETTP, ORNL, and Y-12. Division staff participated in the annual air inspection at ORNL. No significant problems were noted during the field inspection. ORNL was found in compliance with applicable air pollution regulations. Representatives from EPA Region 4 and TDEC visited ORNL to discuss proposed changes to emission stacks.

Oversight of Asbestos Management and Removal. The division continued oversight of asbestos management and removal on the ORR to ensure compliance with air pollution control and solid waste management regulations. Division waste management staff performed site visits to Y-12 to monitor progress on ongoing D&D projects that involved asbestos-containing material. The staff reviewed special waste approval requests for disposal of the asbestos-containing waste in the Y-12 Industrial Landfill and visited the Y-12 landfill to ascertain DOE contractors' adherence to procedures for disposal of asbestos waste. Asbestos removals were ongoing with appropriate methods, and removed asbestos was kept and disposed in a proper manner. No releases were noted.

Air Pollution Monitoring for Heavy Metals. In 1997, the division established an independent monitoring effort to identify overall levels of hazardous pollutants in the air on and around ETTP. The division established comparable air monitoring programs at ORNL and Y-12 in calendar year 1999. High-volume samplers are operated at these

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sites, and samples are collected and analyzed at the state environmental laboratory in Nashville for the following selected heavy metals: arsenic, beryllium, cadmium, chromium, lead, nickel, and uranium as a metal.

The results of the FY 2004 monitoring campaign conducted by TDEC at the ORR sites indicate no apparent elevated levels of hazardous air pollutant metals of concern. Analyses for all metals of concern were below guidelines or the detection limits of laboratory analyses. The scope of the testing was temporarily broadened in the weeks following a fire in May 2004 at ToxCo, a company leasing space at ETTP. The fire involved sodium metal; therefore, the samples were analyzed for the sodium metal as well as the metals mentioned above. The results were received in July 2004, and the metals were undetected, meaning the concentration was below the detection limit of the instruments performing the analysis (2 micrograms per cubic meter). It should also be noted that several commercial incinerator facilities are located west of the ORR in Roane County. The possibility exists that these operations, along with the TVA Bull Run Steam Plant facility east of Oak Ridge in Anderson County and the Kingston Steam Plant (Roane County), could have an impact on ambient air quality around the ORR.

4.3 SOIL AND SEDIMENT QUALITY

4.3.1 Sediment

The division's Environmental Monitoring and Compliance Program samples sediments at 34 sites, 11 of which are located on the Clinch River and two on the Tennessee River. The other 21 sites are located on tributaries of the Clinch River draining from the ORR; these are considered "exit pathways." None are on a stream, such as White Oak Creek or Poplar Creek, that has already been identified as contaminated and that is currently monitored by DOE.

Samples were analyzed for organic, inorganic, and radiological contaminants. The results were compared with standards, known as Preliminary Remediation Goals, established for the ORR based on guidance from EPA. These standards were used because there are no regulatory guidelines for sediment quality, either at the state or federal level. The sediments met the standards for recreational use, meaning that people can safely engage in activities such as fishing, hiking, and playing at these locations.

4.3.2 Radiological Field Surveys

Division staff returned to the 44 sites previously identified to reinvestigate and determine if requested maintenance had been carried out by DOE. Essentially, no action has been taken to address the sites of concern. Therefore, concerns by the division continue to be justified for (public) human health and the environment due to DOE's lack of response.

Many of these sites are located in otherwise uncontaminated areas of the ORR. Removal of the materials would essentially return the areas to pristine conditions.

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4.4 FOOD AND WILDLIFE QUALITY

4.4.1 Environmental Biomonitoring and Oversight

The ORNL Biological Monitoring and Abatement Program (BMAP), a joint program by DOE and its contractor UT-Battelle, examines the effects of DOE-related activities on the ORR and the surrounding community by studying various organisms on land and in streams originating on the ORR. Studies include aquatic toxicity testing, bioaccumulation monitoring, the use of biological indicators, and in-stream ecological monitoring of fish and benthic macroinvertebrate communities. These projects help define the "overall health" of a system by assessing its biotic integrity, identifying possible sources of ecological damage, and determining the effectiveness of DOE remediation efforts. BMAP sampling efforts have established a large database of information spanning nearly two decades. BMAP oversight activities and independent sample monitoring by the division provide a means of assessing the integrity of results obtained and assessments made by BMAP personnel. They also provide an independent analysis of the sampling locations.

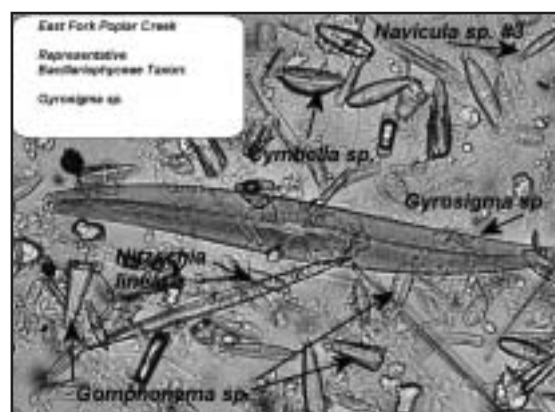
The Environmental Restoration Support Section of the Radiological Monitoring and Oversight Program continued with the independent biological monitoring project during FY 2004. The project involves sampling and monitoring of aquatic vegetation on the ORR, using species such as watercress and green algae as biological indicators. These plants bioaccumulate radionuclides and metals from contaminated water. Habitats monitored included springs, seeps, spring tributaries, East Fork Poplar Creek, and background locations.

The following were also prepared:

- Species counting (taxa richness, etc.),
- chlorophyll analysis,
- stable isotopes analysis (i.e., nitrogen-15 and carbon-13),
- biomass calculations, and
- numerous micro-algae photographs.

This study was done as oversight of and providing taxonomic support to the BMAP. A report is available at the TDEC DOE-Oversight office for review on the results of this study.

During FY 2004, 10 aquatic vegetation samples were collected and submitted to the TDEC environmental laboratory for analysis of metals as well as gamma-, gross alpha-, and gross beta-emitting radionuclides. Laboratory analysis from these samples has shown bioaccumulation of mainly beta-emitting radionuclides in watercress and green



TDEC photo
Diatoms were collected from East Fork Poplar Creek for a taxonomic study.

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algae. These were not at levels to be a cause for concern (range 0.06-4.5 pCi/g). No highly elevated concentrations of heavy metal contaminants of concern have been reported in the laboratory analyses. However, low concentrations of zinc and lead (145–643 mg/kg) were found to have been bioaccumulated in several watercress and green algae samples. Finally, approximately 180 periphyton samples were collected from artificial substrates for the algae study. The digital camera image below is a 400-times power magnification of periphyton biomass (predominantly diatoms) collected from East Fork Poplar Creek.

The Environmental Restoration Support Section also conducted field mapping and reconnaissance of invasive and native plant species on a portion of the proposed 3000-acre conservation easement parcel on Blackoak Ridge and McKinney Ridge. The conservation easement is under consideration in response to natural resource damages by DOE to the Lower Watts Bar Reservoir under the auspices of the Natural Resource Damage Assessment process of CERCLA. Approximately 1200 acres of the conservation easement area were field-mapped by division staff during FY 2004. Plant species were inventoried as 50-foot-diameter plots in a series of transects and grids. Each plot was located and coordinates were recorded using a Garmin Etrex(TM) hand-held global position system unit. Several hundred photographs were taken of plants and habitats in the field using a digital camera. A database of all field information is being compiled as field surveys continue into the next fiscal year on the remainder of the parcel. Below are examples of invasive (kudzu) and native (false foxglove) plants observed during the survey.

4.4.2 Milk Sampling

The division's Environmental Monitoring and Compliance Program oversees DOE's milk sampling program for the areas surrounding the ORR. Contractors for DOE and UT-Battelle take samples of milk from two locations in the vicinity of the ORR and one background location in Maryville and analyze them for radiological contamination. The data show that milk from the sampling area is not contaminated.

4.4.3 Vegetable Sampling

The division's Environmental Monitoring and Compliance Program oversees DOE's vegetable sampling program for areas around the ORR. DOE contractors purchase lettuce, tomatoes, and turnips from area gardeners for radiological analysis. There are six sampling sites: three in Oak Ridge, one between Kingston and Oak Ridge, one between Lenoir City and Oak Ridge, and one in Claxton. The data shows no radiological contamination in the vegetables.

4.4.4 Fish

Division personnel conduct inspections annually of sign postings advising the public against fish consumption and water contact in waters that have been or could be impacted by DOE operations. The advisory posting program is part of a larger, more encompassing sign-posting and inspection project coordinated by the TDEC Environmental Assistance Centers in Knoxville and Chattanooga.

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The division focuses its efforts on waters within and surrounding the ORR. Areas of responsibility include Melton Hill Reservoir, above Melton Hill Dam, and Watts Bar Reservoir, including the Clinch River, Tennessee River, and Lower Tennessee River arms. The advisory postings include warnings against consumption of catfish, striped bass, and Cherokee bass (striped bass/white bass hybrid). Precautionary postings warn certain groups of individuals (children, pregnant women, and nursing mothers) not to eat any of the listed fish. All others are warned to limit their consumption to about two meals per month. Fish included on precautionary signs are white bass, sauger, carp, smallmouth buffalo, and largemouth bass.

Posting inspections are also conducted along East Fork Poplar Creek from the Y-12 Bear Creek Road entrance to the most western point at which Oak Ridge Turnpike crosses the stream. Signs have been placed along this portion of East Fork Poplar Creek, effectively covering the residential areas of Oak Ridge. These postings warn against direct contact with the water due to contamination by E. coli bacteria.

The division conducted the 2004 annual sign posting inspection from March 9-March 17. Six of the 24 signs along Melton Hill Reservoir and four of the 38 signs along Watts Bar Reservoir were missing or defaced and required appropriate remedies. Five of the 39 signs located along East Fork Poplar Creek were missing and required replacement.

TVA conducts an annual Community Assessment Project to evaluate the condition of reservoirs in the Tennessee River Valley. The division acquired largemouth bass from TVA at four locations around the ORR during the annual 2002 Community Assessment Project in order to compare results with those from other agencies and organizations. Tissue samples from these fish were analyzed for mercury, arsenic, PCBs, gross alpha, gross beta, and gamma radionuclides. The results from the largemouth bass study reasonably supported the current postings. Results, however, also indicate that more work should be done to accurately quantify PCB concentrations in largemouth bass tissue in both the Tennessee and Clinch rivers. Accurate quantification of contaminants in tissue is difficult. Furthermore there are seasonal fluctuations in concentrations that result from the varying fat content of the fish. The division has a project to analyze fish tissue from Melton Hill and Watts Bar reservoirs for PCBs and mercury. At this time, the project is scheduled for completion by the end of calendar year 2004.

4.4.5 Aquatic Life

During spring 2004, division personnel conducted oversight trips in conjunction with the annual ORNL BMAP fish and benthic macroinvertebrate sampling events. Established scientific protocols and accepted sampling field methods were followed. The division annually conducts an independent assessment of benthic macroinvertebrate communities at the same stream locations sampled by BMAP. In late April, division personnel collected benthic macroinvertebrate samples for laboratory and semi-quantitative analyses. The field samples are being processed, and the results are expected in 2005. Past results indicated the study streams showed signs of increasing water quality with a general improvement of biotic integrity downstream of DOE activities.

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Current Fish Advisories

Stream	County	Portion	Pollutant	Comments
East Tennessee				
Boone Reservoir	Sullivan, Washington	Entirety	PCBs, chlordane	Precautionary advisory for carp and catfish.*
Chattanooga Creek	Hamilton	Mouth to GA line	PCBs, chlordane	Fish should not be eaten. Avoid contact with water also.
E. Fork of Poplar Creek, incl. Poplar Creek embayment	Anderson, Roane	Mile 0.0-15.0	Mercury, PCBs	Fish should not be eaten. Avoid contact with water also.
Fort Loudon Reservoir	Loudon, Knox, Blount	Entirety	PCBs	Commercial fishing for catfish prohibited by TWRA. Catfish, largemouth bass over two pounds, or any largemouth bass from the Little River embayment should not be eaten.
Melton Hill Reservoir	Knox, Anderson	Entirety	PCBs	Catfish should not be eaten.
Nickajack Reservoir	Hamilton, Marion	Entirety	PCBs	Precautionary advisory for catfish.*
N. Fork Holston River	Sullivan, Hawkins	Mile 0.0-6.2	Mercury	Do not eat the fish. Advisory goes to TN/VA line.
Tellico Reservoir	Loudon	Entirety	PCBs	Catfish should not be eaten.
Watts Bar Reservoir	Roane, Meigs, Rhea, Loudon	TN River portion	PCBs	Catfish, striped bass, and hybrid (striped bass-white bass) should not be eaten. Precautionary advisory* for whit bass, sauger, carp, smallmouth buffalo, and largemouth bass.
Watts Bar Reservoir	Roane, Anderson	Clinch River arm	PCBs	Striped bass should not be eaten. Precautionary advisory for catfish and sauger.*
Middle Tennessee				
Woods Reservoir	Franklin	Entirety	PCBs	Catfish should not be eaten.
West Tennessee				
Loosahatchie River	Shelby	Mile 0.0-20.9	Chlordane, other organics	Do not eat the fish
McKellar Lake	Shelby	Entirety	Chlordane, other organics	Do not eat the fish.
Mississippi River	Shelby	MS line to just downstream of Meeman-Shelby State Park	Chlordane, other organics	Do not eat the fish. Commercial fishing prohibited by TWRA.
Nonconnah Creek	Shelby	Mile 0.0-1.8	Chlordane, other organics	Do not eat the fish. Advisory ends at Horn Lake Road bridge.
Wolf River	Shelby	Mile 0.0-18.9	Chlordane, other organics	Do not eat the fish.

* Precautionary Advisory: Children, pregnant women, and nursing mothers should not eat the fish species named. All other persons should limit consumption of the named species to one meal per month.

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Samples for analysis were transported to the state's Central Laboratory in Nashville. Results will be published in the 2004 Environmental Monitoring Report. The results from the 2003 independent sampling event can be obtained from the 2003 Environmental Monitoring Report, available at the division office or at <http://www.state.tn.us/environment/doeo>.

4.4.6 White-Tailed Deer

Division personnel monitor results from the fall deer hunts conducted on the ORR. The annual deer hunts began in 1985 as a method of population control. The most prevalent contaminants found in the deer are cesium-137, a gamma emitter known to accumulate in body tissue, and strontium-90, a beta emitter known to accumulate in bone. Three hunts occurred in 2003, on October 18-19, November 8-9, and December 6-7. Personnel at the checking station retained two of the 74 deer harvested during the October hunt due to internal radiological contamination. None of the 92 deer harvested during the November hunt and none of the 90 deer taken in the December hunt were retained due to internal radiological contamination. Deer are a bioindicator of the effectiveness of the overall cleanup program.

4.4.7 Canada Geese

Past studies conducted by ORNL personnel have shown that a small proportion of Canada Geese residing at ORNL may become contaminated. Consequently, an annual goose roundup is conducted at ORNL, locations near ETTP and Y-12, and other sites on the ORR. Geese are collected and scanned to determine if they are contaminated by radionuclides and other hazardous contaminants. Since 1991, this has been a cooperative project between the Tennessee Wildlife Resources Agency, DOE, BMAP teams, and division staff.

The June 2004 goose roundup surveyed 297 geese, including 248 adults and 49 juveniles, from five locations on and around the ORR. All geese received a unique leg band, and most adults received a neck collar if they did not already have one. Four individuals were sacrificed for tissue analysis and archiving. None of the captured geese contained levels of cesium-137 above the DOE administrative control level of 5 pCi/g. In fact, all captured geese had levels of cesium-137 below 0.3 pCi/g. This is a significant improvement over past years.

All the captured geese had cesium-137 levels below 0.3 pCi/g. This is a significant improvement over past years.

Since none of the captured geese had levels above the DOE administrative control level of 5 pCi/g, the division conducted no off-site sampling. Contaminated geese have never been found off the ORR.

4.4.8 Wild Turkey

Two managed weekend hunts on the ORR are open to the public annually. Since the managed turkey hunts began, only two turkeys have been retained due to radiological

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contamination. Those turkeys were retained in 1997 and 2001 due to slightly elevated strontium readings. The administrative release criteria are 20 pCi/g for bone tissue and 5 pCi/g for whole body count.

The 2004 turkey hunts were held on April 3-4 and April 17-18. Of the 22 turkeys taken during the first hunt, none were retained due to internal radiological contamination. The second hunt produced 15 turkeys, with none being retained due to internal radiological contamination.

4.4.9 Clinch River Fish Sampling

ORNL personnel conduct biological monitoring in the Clinch River to examine potential exposure to the public from the consumption of contaminated fish. Sunfish and catfish are collected annually at designated test sites and reference locations in the river. Fish fillets are analyzed for metals, pesticides, PCBs, cobalt-60, cesium-137, and total radioactive strontium. Oversight activities were conducted in May 2004. The field samples are being processed, and the results are expected in 2005.

4.4.10 Threatened and Endangered Species

Division personnel conduct evaluations on threatened and endangered plant and animal species on the ORR in support of the TDEC Division of Natural Heritage. Field surveys are conducted and report documents are reviewed as needed. The division keeps an inventory of those plant and animal species that are on the state and EPA lists for surveillance. The Division of Natural Heritage did not request threatened and endangered species field assistance from the division during the 2004 fiscal year.



ORNL and state personnel prepare to sample a pond near ETP.

TDEC photo

5.0 Key Challenges

The following is a summary of key challenges facing DOE, the community, and the state.

5.1 GROUNDWATER MANAGEMENT STRATEGIES

The CERCLA remedial action strategy at Oak Ridge has long been to make cleanup decisions on sources of contaminants before addressing groundwater. Sources may be burial grounds, spill sites, leaking tanks, contaminated soils, etc. This strategy remains valid and is reflected in the types of RODs that have been put in place over the past decade. However, a difficult decision is left for the future: What is to be done about contaminated groundwater. Because of the complex geology and hydrology of the Oak Ridge site, the cleanup of contaminated groundwater is a daunting task. The present strategy is to attack sources first, then institute groundwater remedies specific to individual problems. In some cases, groundwater can be remediated using traditional methods; in other cases, new technologies will be applied. However, some problems may not have definitive solutions by the time decisions must be made. Some remedies may take many years to return groundwater to a safe usable condition. In this event, DOE must have adequate long-term stewardship and institutional controls in place to assure continued protectiveness to the environment and human health.

A difficult decision is being left for the future: What is to be done about contaminated groundwater?

5.2 LONG-TERM STEWARDSHIP RESPONSIBILITIES

Contamination, both hazardous and radioactive, will remain on the ORR for many years, long after the cleanup program has come to a close. As a result, long-term risk to the public and the environment will remain unless active care and monitoring of this contamination is maintained. The state is requiring that DOE ensure adequate funding for this care, independent of annual appropriations from Congress. If it is to be effective, long-term stewardship must also be accompanied by improvements in record keeping, enforcement, surveillance, maintenance, monitoring, and funding.

5.3 THE FEDERAL COMMITMENT

DOE, EPA Region 4, and the state have signed an Oak Ridge Accelerated Cleanup Plan Agreement. The accelerated cleanup program will complete the closure of ETTP, undertake interim actions in Melton Valley to cap historical disposal sites and control the spread of contamination in the groundwater, and complete other high-risk projects on and off the ORR by 2008. The plan calls for all stored legacy waste from the Oak Ridge site to be disposed by 2005 and CERCLA cleanup at Oak Ridge to be completed by 2016. If this plan is successful, it will reduce cost by an estimated \$2 billion-plus and accelerate completion of the Environmental Management Program by five years. Adequate annual funding is imperative to achieving agreed goals.

5.0 Key Challenges

Since the terrorist attacks of September 11, 2001, many formerly public documents, including environmental plans and reports, have been categorized as "Official Use Only" due to security concerns. This has resulted in "redaction" of maps and references to strategic facilities or materials in versions certified as suitable for public release. The state does not hold records designated as Official Use Only because it cannot, by law, keep them from public access. The state reviews Official Use Only and classified documents in designated DOE facilities. If available, redacted copies are kept in state files. However, this increased security has limited access by the general public to important environmental information freely released in the past. This causes concern about maintaining effective public input into NEPA and CERCLA decisions.

5.4 CHARACTERIZATION AND DISPOSAL OF RADIOACTIVE WASTE

One obstacle to completing accelerated cleanup is the characterization and disposal of stored radioactive waste. DOE self-regulates radioactive waste. This waste is physically in the way of cleanup activities, and administratively the accelerated plan cannot be considered finished until this waste is characterized and properly disposed. DOE must make this activity a higher priority than it has in the past to achieve accelerated cleanup.

The treatment and disposal of remote-handled TRU waste is of particular concern.

Waste with both radioactive and hazardous components is termed "mixed" waste. Although DOE is self-regulating in the area of radioactivity, states do regulate the hazardous constituents in wastes. Because Tennessee has this authority, it has been able to negotiate milestones and targets with DOE

for characterization, treatment, and disposal of mixed low-level and mixed TRU wastes under the Federal Facilities Compliance Act Site Treatment Plan. Over the years, funding shortfalls and a lack of disposal options have made these schedules difficult to attain, and stored wastes have continued to accumulate.

The treatment and disposal of remote-handled TRU waste is of particular concern to the division. ORR has the largest inventory of this waste destined for disposal at the Waste Isolation Pilot Plant in New Mexico of any DOE site. A permit from New Mexico officials allowing the plant to accept remote-handled TRU waste has been delayed; as a result, the state and DOE have had to renegotiate Site Treatment Plan schedules for this waste in Oak Ridge. DOE has requested that the TRU waste milestones be removed from the Site Treatment Plan. TDEC has denied the request, and DOE has disputed the state's decision. The matter remains under dispute.

5.5 INCORPORATING HISTORIC PRESERVATION INTO CLEANUP ACTIVITIES

The ORR is home to three Manhattan Project-era plants designated by DOE as "Signature Facilities." These are the Graphite Reactor at ORNL, the Beta 3 Calutron Racetrack at Y-12, and the U-shaped K-25 Gaseous Diffusion Plant at ETTP. The Accelerated Cleanup Program includes plans for demolition of the K-25 building. Under

5.0 Key Challenges

pressure from stakeholders and the state, DOE has undertaken studies to assess how to best preserve and interpret the history, features, and artifacts of the K-25 plant. Other buildings in ORR historical districts have been or are slated for demolition.

Coordination with the Tennessee Historical Commission, an office of TDEC, ensures that the lessons of the Manhattan Project are not lost for future generations. Although environmentally hazardous facilities must be demolished and contaminated debris disposed of, selected artifacts will be preserved, and buildings will be photographed and documented.



Cultural resources on the ORR include several pre-existing cemeteries. TDEC photo

6.0 Health Studies & Emergency Response

6.1 HEALTH STUDIES

Concerns have been raised for years concerning contaminants from the ORR and health problems they may have caused for workers on-site and for nearby residents.

Several government agencies have moved to address these concerns, through energy-related research, health-related studies, and public health activities centered on the ORR. These activities have been conducted by the National Center for Environmental Health, the National Institute for Occupational Safety and Health, the Agency for Toxic Substances and Disease Registry (ATSDR), the Centers for Disease Control and Prevention (CDC), and the Tennessee Department of Health.

Health studies and assessments already conducted or ongoing in Oak Ridge are grouped into three main areas:

- Off-site contamination,
- Community health studies and activities, and
- Workers health studies.

6.1.1 Oak Ridge Reservation Health Effects Subcommittee

ATSDR and other CDC agencies established an Oak Ridge Reservation Health Effects Subcommittee made up of a knowledgeable and representative group from the Oak Ridge area. The subcommittee is a federal advisory committee that provides advice and recommendations to the CDC and ATSDR about the agencies' off-site public health activities and research at the ORR.

Subcommittee members seek to involve those who are interested in and affected by ATSDR and CDC public health activities at the ORR. There have been numerous meetings, presentations, discussions, workgroup activities, and various completed and ongoing projects since ATSDR established the subcommittee in 1999. As ATSDR concludes its efforts, these activities should result in an increased local emphasis on environmental medicine. The health concerns of exposed individuals can be addressed through clinical intervention combined with health education.

The division is represented by a liaison who is a non-voting member of the subcommittee. The role of the liaison is to provide the subcommittee and the federal agencies with requested information regarding contamination on and off the ORR.

ATSDR has completed two public health assessments, one for Y-12 uranium releases and the other for White Oak Creek radionuclide releases to the Clinch River and Lower

6.0 Health Studies & Emergency Response

Watts Bar Reservoir. In both assessments, ATSDR concluded that the level of contaminants to which people nearby were exposed poses no apparent health hazard from either radiation or chemical exposure.

The public health assessment is the primary process ATSDR uses to evaluate the potential impact of ORR hazardous releases on the health of nearby communities.

6.2 EMERGENCY RESPONSE

6.2.1 Tennessee Emergency Management Agency

TEMA is the state's emergency management arm. Located within the Military Department of Tennessee, TEMA provides technical assistance, supplies, equipment, and training to local governments. The agency also administers funding from the state and federal governments.

TEMA operates a 24-hour emergency operations center. This center manages emergency information and coordinates state and federal assistance from one location.

Under the TOA, DOE is required to provide technical and financial assistance for emergency response. TEMA is the primary state agency responsible for implementing the following provisions:

- Developing and maintaining the state's Multi-Jurisdictional Emergency Response Plan for ORR facilities in accordance with federal laws and regulations;
- Organizing and participating in annual emergency response exercises and drills with affected state agencies and local governments;
- Training state and local government employees and officials, as well as volunteers who may be called upon in the event of an emergency at the ORR; and
- Acquiring and maintaining equipment-with funds provided by DOE-for TEMA and affected counties to support the Emergency Response Plan.

TEMA is responsible for emergency response planning and training; in 2004 TEMA trained the responders in communities through which UF₆ cylinders would be transported from ETTP north to the state line.



TDEC photo
At the center of this photo, a plume of smoke rises from the fire caused by an extreme reaction of sodium and water at a tenant's facility at ETTP

6.0 Health Studies & Emergency Response

The Emergency Response Plan is the basic plan that describes general concepts that guide the off-site response to an emergency at the ORR. This plan is shared with emergency response organizations in Anderson, Knox, Loudon, and Roane counties. It provides the purpose, scope, and execution of the plan; the state's mission; assignment of emergency responsibilities and actions; and descriptions of the major emergency response organizations.

6.2.2 TDEC DOE Oversight Division

The division maintains the capability to respond to environmental emergencies and supports TEMA in technical issues that may result from DOE activities in Oak Ridge. The division is constantly accessible to TEMA through the use of a dedicated duty person and a 24-hour paging system.

The division annually participates in a series of exercises in Oak Ridge. These exercises involve DOE, TEMA, and local agencies from Anderson, Knox, Loudon, and Roane counties. In 2004, the emergency exercises involved the National Nuclear Security Administration's Y-12 Plant.



TDEC photo

State Radiation Health personnel and members of DOE's Radiological Assistance Program team scan the surface of Highway 95 to identify areas of strontium-90 contamination.

In an emergency or exercise, the division maintains and fully staffs the Environmental Monitoring Control Center and Environmental Field Monitoring Teams. The

Environmental Monitoring Control Center is located at TEMA-East in Alcoa. The Environmental Field Monitoring Teams are dispatched from Alcoa. In addition, the division supplies a staff member to the Field Coordination Center. The division also supplies a staff member to DOE's Joint Information Center in the Powell community of Knox County.

The division supports TEMA through development of a system to track and evaluate reportable occurrences at the ORR. Daily occurrence reports are sent to the division.

The division responded to two actual emergencies involving off-site releases in May 2004. In the first instance, a dump truck carrying radioactive waste from ORNL to the EMWMF leaked water contaminated with strontium-90 along the route, contaminating a stretch of state Highway 95. In the second instance, a tenant at ETTP caused a sodium fire during chemical operations, which created a smoke plume that drifted off-site.

7.0 Outreach

The division conducts public outreach at the local, state, and national levels. By attending public meetings to make presentations and act as an information resource, the division helps the public learn about the ORR's environment. The division's local and state activities are included under the TOA. Its national activities include membership in a variety of programs and initiatives. The division also maintains a World Wide Web site with detailed information about ORR environmental issues at <<http://www.state.tn.us/environment/doeo>>.

Other community organizations that monitor DOE activities in Oak Ridge also seek to include the public in their work. In addition, DOE has an extensive outreach program to solicit public input on environmental concerns, and the agency has established an information center to give stakeholders direct access to relevant documents.

Outreach programs enable the public to play a meaningful role in environmental decision-making. Following are the major public outreach efforts undertaken by a variety of organizations concerned with DOE's environmental management program at Oak Ridge. Contacts for local and state initiatives-including addresses, phone and fax numbers, and web sites-are listed in the appendix.

7.1 TDEC DOE OVERSIGHT DIVISION

7.1.1 Local and Regional Activities

One form of public outreach used by the division is to share knowledge and experience with local students. This year one division staff member helped set up the new Science Center at the Woodland Elementary School in Oak Ridge.

The division works with the following local or regional organizations regarding issues associated with the ORR:

- Watts Bar Interagency Group (see sidebar)
- Tri-State Depleted UF₆ Working Group
- Oak Ridge Reservation Health Effects Subcommittee (see Section 6.1.1)
- Oak Ridge Reservation Local Oversight Committee (LOC)
- Oak Ridge Site Specific Advisory Board

7.1.2 National Activities

At the national level, division staff members participate in a wide range of initiatives that may affect the ORR, the Oak Ridge community, or the state. These initiatives include involvement in the following groups:

Interstate Technology and Regulatory Council. The Interstate Technology and Regulatory Council was formed in 1995 as a multi-state coalition working to achieve

7.0 Outreach

regulatory acceptance of innovative environmental technologies. The state-led council became affiliated with the Environmental Council of States in 1999 and has been working closely with that organization to promoting the examination of innovative technology for conducting more cost-effective and efficient site cleanups. The Radiological Monitoring Section representative for the state has been working with the council to create cleanup levels for radionuclides in soils. A training workshop has been established on the Internet. The group, with one division staff member as an author, published a guidance document on long-term stewardship.

The National Governors Association Federal Facilities Task Force. This task force provides a forum for open and effective dialogue between DOE host states and DOE officials on their respective concerns and priorities. FY 2004 issues included waste management and disposition, long-term stewardship and risk-based end states.

The National Conference of State Legislatures' State and Tribal Government Working Group. The State and Tribal Government Working Group is a forum in which all tribes affected by DOE sites can interact directly with the states and DOE. Major interest areas for FY 2004 were risk-based end states, long-term stewardship, treaty issues, and transportation and disposition of cleanup waste.

The Association of State and Territorial Solid Waste Management Officials Radiation Task Force. This organization tracks radiation-related issues that could affect EPA region states. The division represented the task force at a workshop at Nuclear Regulatory Commission headquarters on the disposition of radioactively contaminated solid materials. The task force gets regular updates and provides comments to the U.S. Army Corps of Engineers, the Nuclear Regulatory Commission, and EPA. Important information is sent on to other divisions and states in EPA Region 4. The division presented a talk, "Remediation and Emergency Response on the Oak Ridge Reservation," at a national association meeting in Washington, D.C., this past summer.

The Tri-State (Tennessee, Kentucky and Ohio)/DOE Depleted Uranium Hexafluoride Working Group. This group has meetings and weekly conference calls to work out details of the shipment of UF₆ cylinders from ETTP to Portsmouth, Ohio. It has evolved from a small group of mid-level environmental managers to include a larger contingency of legal, policy, emergency response, law enforcement, and DOE UF₆ cylinder staff. The "nuts and bolts" of UF₆ transportation are being worked out. This group has existed since 1997. Due to the efforts of this group, over 1,900 cylinders have been shipped as of October 2004.

Division activities also include participating as Tennessee's representative during the DOE Intergovernmental Group's Risk-Based End States Next Steps Workshop.

7.2 OAK RIDGE RESERVATION LOCAL OVERSIGHT COMMITTEE (LOC)

Representatives from the division participate in meetings of the LOC, an organization chartered under the TOA. The LOC's mission is to ensure that the best interests of

7.0 Outreach

member communities are protected and that public funds are used wisely during cleanup, continued operation, and reindustrialization at the ORR. The LOC is governed by a board of directors, which includes local elected and appointed officials from the city of Oak Ridge and the counties of Anderson, Roane, Knox, Loudon, Meigs, Rhea and Morgan. Board members are concerned with human health and the environment, emergency management issues, and any impacts on their communities' economic and social well being.

The board is advised by a 20-member Citizens' Advisory Panel (CAP). Created in early 1995, the CAP provides advice based on in-depth reviews of DOE documents and studies of community concerns. CAP meetings often begin with presentations by experts on issues of current interest to the greater Oak Ridge community.

CAP members attend meetings of other organizations concerned with environmental, economic, and health issues in order to better evaluate the range of stakeholder opinions. The CAP regularly transmits public concerns to the LOC Board and to DOE, EPA, and various divisions within TDEC.

In the past year, issues addressed by the LOC and the CAP have included the following:

- The environmental management budget process and its implications for cleanup on the ORR,
- Accelerated cleanup impacts on future land use and reindustrialization,
- Community concerns over long-term stewardship of remediated sites,
- Historic preservation on the ORR and its appropriate integration with cleanup planning and activities,
- Capacity and use of the CERCLA waste disposal facility for various cleanup wastes,

Watts Bar Interagency Working Group Agreement

The Watts Bar Interagency Working Group Agreement was signed and became effective in February 1991. The purpose of the agreement is to establish a procedure for the interagency coordination and review of permitting and other use authorization activities by the U.S. Army Corps of Engineers (USACE), Nashville District, and the Tennessee Valley Authority which could result in the disturbance, resuspension, removal and/or disposal of contaminated sediments or potentially contaminated sediments in the Watts Bar Reservoir. The agreement identifies the cooperative efforts of DOE, EPA Region 4, USACE, TVA, and TDEC to achieve this goal. The interagency agreement relates only to the issues associated with the contaminated or potentially contaminated sediments resulting from the DOE operations at Oak Ridge, Tennessee. It does not suspend or void other permit review and coordination agreements that currently exist between the participants, nor does it preempt or limit in any way the authority of TDEC, EPA, TVA, USACE, or DOE for those matters which are under their regulatory or statutory jurisdiction or authorization. This agreement does not address, nor is it intended to address, any remediation responsibility of any of the parties.

In essence, the activities consists of preliminary reviews of proposed sediment disturbance activities within Watts Bar to ascertain the potential impacts of those activities on the spread of contaminants that have been deposited as result of activities at the Oak Ridge Reservation. Preliminary proposals are reviewed, sediment data is collected and reviewed and a joint recommendation from the working group is provided to the permitting agencies for their consideration during the permitting decision.

7.0 Outreach

- Political issues related to the decision-making process for waste disposal, especially UF₆ cylinders and TRU waste, and
- Review of circumstances and emergency response efforts for actual incidents and exercises in FY 2004.

The LOC's outreach efforts include a periodic newsletter, *Insights*, presentations to community groups and governmental entities, an e-mail news list, and an Internet presence at <<http://www.local-oversight.org>>. The LOC is staffed by an executive director and an administrative assistant. For further information about the LOC or to be added to the newsletter mailing list, contact Susan Gawarecki in Oak Ridge by phone at (865) 483-1333, toll free at (888) 770-3073, or by e-mail at loc@icx.net.

7.3 LOCAL GOVERNMENT ENVIRONMENTAL BOARDS

7.3.1 Oak Ridge Environmental Quality Advisory Board

The Oak Ridge Environmental Quality Advisory Board is an official board of the city of Oak Ridge. Its members are appointed by the City Council, and the board, in turn, advises the City Council on environmental issues. Because the ORR is within the city limits of Oak Ridge, one of the board's primary functions is to review and comment on DOE cleanup activities that potentially affect the city. The board's web site is found at <<http://orserv01.ci.oak-ridge.tn.us/eqab>>.

7.3.2 Roane County Environmental Review Board

Members of this official Roane County governmental board are appointed by the county executive and confirmed by the County Commission. The board advises both the county executive and the commission on environmental matters, including those resulting from the presence of two major ORR facilities-ORNL and ETTP-in Roane County. Roane County continues to attract commercial waste management firms interested in doing business with DOE and outside clients. In addition, three incinerators on or near the ORR are situated within county boundaries. The east end of Roane County will have a variety of DOE-related cleanup, waste management, and transportation issues to monitor for years to come.

7.4 DEPARTMENT OF ENERGY

DOE works with TDEC and EPA to foster public involvement in environmental remediation decision-making. Opportunities may include informal conversations, electronic communications, scheduled meetings and workshops, legally required permit hearings, and stakeholder advisory groups.

Some portions of DOE's public involvement program are required under CERCLA and specified in the FFA. A Public Involvement Plan, updated every three years, is one example.

7.0 Outreach

7.4.1 Public Involvement and Outreach

DOE's Community Relations office produces two publications distributed to interested individuals. The monthly Public Involvement News summarizes upcoming public meetings, announcements, availability of documents, pending NEPA actions, and opportunities for public involvement. Cleanup Progress is an annual report highlighting DOE's Environmental Management activities and decisions of the preceding fiscal year. It also fulfills the annual regulatory reporting requirement under the terms of the FFA. Individuals can be added to the Community Relations mailing list by contacting Walter Perry, manager of community relations for DOE's Oak Ridge Environmental Management program, at (865) 576-0885, or they can pick up a copy of either publication at the DOE Information Center, 475 Oak Ridge Turnpike in Oak Ridge.

Environmental Management activities are also detailed on the Internet at <http://www.oakridge.doe.gov/em> and at <http://www.bechteljacobs.com>, which provides links to public documents, meeting and event calendars, and other information sources.

7.4.2 Oak Ridge Site Specific Advisory Board

The Oak Ridge Site Specific Advisory Board is an advisory committee to DOE's Environmental Management organization and is chartered under the Federal Advisory Committee Act of 1972.

The board provides advice to DOE's Oak Ridge Environmental Management program both on policy issues and on specific decision documents. The board consists of up to 20 members from the greater Oak Ridge region who are concerned about environmental restoration and waste management. Representatives from TDEC, DOE, and EPA Region 4 attend meetings as non-voting members to act as a resource for information and to hear concerns of the board. The board's standing committees are Environmental Management and Stewardship.

All board and committee meetings are open to the public and are announced in newspaper advertisements, in the Federal Register, at the Information Resource Center in Oak Ridge, and through the board's 24-hour information line at (865) 576-4750. Board meetings are recorded on video, and copies of the tapes are available for public review. The board produces a quarterly newsletter called "The Advocate," and its Web site is at <http://www.oakridge.doe.gov/em/ssab/>. Information is also available by calling the board's support office (see appendix).

The ORSSAB provides advice to DOE's Oak Ridge Environmental Management program both on policy issues and on specific decision documents.

7.0 Outreach

7.4.3 National Environmental Policy Act

NEPA requires federal agencies to provide public officials and citizens with environmental information for proposed federal actions that could affect environmental quality. This is accomplished through the preparation of one of two documents: an environmental impact statement if the proposed action will have a significant impact on environmental quality, or an environmental assessment if the impact is not significant. The environmental impact statement requires public involvement and access to information regarding DOE proposals. Formal public meetings are held in conjunction with the scoping and release of an environmental impact statement, giving regulators and citizens an opportunity to comment openly on DOE's planned activities.

In 1994, DOE adopted a policy that combines the public involvement procedures of NEPA and CERCLA for major cleanup decisions. This policy states, "CERCLA documents will incorporate NEPA values, such as analysis of cumulative, off-site, ecological, and socioeconomic impacts, to the extent practicable." DOE's policy and announcements on pending NEPA actions are available on its web site at <<http://tis-nt.eh.doe.gov/nepa>>.

7.4.4 DOE Information Center

The DOE Information Center is the repository for all publicly available material about DOE's Oak Ridge Operations. The Information Center, located at 475 Oak Ridge Turnpike, is also the official repository for all information and documents that support or compose the administrative record for the FFA. This includes such information as newspaper articles related to the ORR, official correspondence, and decision documents on site remediations. It is also the storage area for documents requested under the Freedom of Information Act, newly released or declassified files and information dealing with health issues, and documents covering all aspects of the ORR's environment not otherwise part of the administrative record.

These files are accessible to the public and may be read on the premises, or the staff will copy documents on request. The Information Center's phone number is (865) 241-4780.

Appendix

Local Government & Stakeholder Organizations

The Oak Ridge Reservation Local Oversight Committee, Inc. (LOC)

Susan Gawarecki, Executive Director
102 Robertsville Road, Suite B
Oak Ridge, TN 37830
Phone: (865) 483-1333; Fax: (865) 482-6572
E-mail: loc@icx.net
Web site: <http://www.local-oversight.org>

City of Oak Ridge Environmental Quality Advisory Board

Ellen Smith, Chair
City of Oak Ridge, P.O. Box 1
Oak Ridge, TN 37831-0001
Phone: (865) 482-8320; Fax: (865) 425-3426
E-mail: EQAB@cortn.org
Web Site: <http://www.cortn.org/eqab/>

Roane County Environmental Review Board

Ed Strain, Chair
Roane County Courthouse
P.O. Box 643
Kingston, TN 37763
Phone: (865) 376-5578; Fax: (865) 376-4318
E-mail: edstrain@bellsouth.net

Oak Ridge Site Specific Advisory Board

Kerry Trammell, Chair
P.O. Box 2001, EM-90
Oak Ridge, TN 37831
Phone: (865) 241-3665; Fax: (865) 576-5333
E-mail: grossRS@oro.doe.gov
Web Site: <http://www.oakridge.doe.gov/em/ssab/>

League of Women Voters of Oak Ridge

Margaret Beams, President
P.O. Box 4073
Oak Ridge, TN 37831-4073
Phone: (865) 482-2243
E-mail: lwvor@bellsouth.net
Web Site: <http://www.lwvor.com>

Community Reuse Organization of East Tennessee

Lawrence Young, President
107 Lea Way, P.O. Box 2110
Oak Ridge, TN 37831-2110
Phone (865) 482-9890; Fax (865) 482-9891
E-mail: younglt@croet.com
Web Site: <http://www.croet.com>

East Tennessee Environmental Business Association

Jenny Freeman, Executive Director
P.O. Box 5483
Oak Ridge, TN 37831-5483
Phone: (865) 483-9979; Fax: (865) 481-8928
E-mail: jenny@eteba.org
Web Site: <http://www.eteba.org>

Atomic Trades and Labor Council

P.O. Box 4068
Oak Ridge, TN 37831-4068
(865) 483-8471
Web Site: <http://www.atlcunion.org/>

Paper, Allied-Industrial, Chemical, and Energy Workers International Union

Local 5-288
133 Raleigh Road
Oak Ridge, TN 37830
Phone: (865) 483-3745; Fax: (865) 483-6460
E-mail: pace@icx.net
Web Site: <http://www.paceunion.org/>

Oak Ridge Reservation Health Effects Subcommittee

Bill Taylor, Administrator
ATSDR Oak Ridge Field Office
197 S. Tulane Avenue
Oak Ridge, TN 37830
Phone: (865) 220-0295
E-mail: wxt4@cdc.gov
Web Site:
<http://www.atsdr.cdc.gov/HAC/oakridge/>

Appendix

Coalition for a Healthy Environment

Harry Williams, President
12410 Buttermilk Road
Knoxville, TN 37932
Phone: (865) 693-7249
Fax: (865) 531-6217
E-mail: harry.williams2@worldnet.att.net

Save Our Cumberland Mountains

P.O. Box 479
Lake City, TN 37769
Phone: (865) 426-9455
Fax: (865) 426-9289
E-mail: info@socm.org
Web Site: <http://www.socm.org>

Advocates for Oak Ridge Reservation

136 West Revere Circle
Oak Ridge, TN 37830
Phone: 865-483-0849
E-mail: aforr@kornet.org
Web site: <http://www.kornet.org/aforr/>

Oak Ridge Environmental Justice Committee

100 Wiltshire Drive
Oak Ridge, TN 37830-4505
Phone/Fax: (865) 482-1559
E-mail: brooks50@comcast.net
Web site:
<http://home.comcast.net/~brooks50/orejc.html>

State Contacts

Tennessee Department of Environment and Conservation

Department of Energy Oversight Division

761 Emory Valley Road
Oak Ridge, TN 37830
Phone: (865) 481-0995
Fax: (865) 482-1835
E-mail: John.Owsley@state.tn.us
Web site:
<http://www.state.tn.us/environment/doeo>

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Environmental Monitoring and Compliance

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